final report

Murphy Creek Hydroelectric Project

Agriculture Studies

for

B. C. Hydro & Power Authority

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This impact assessment is based on the "Murphy Creek Project Engineering Description" prepared in November 1982. Since that time, ongoing planning and design studies have resulted in some changes that would affect the project description. The principal changes are as follows:

- In-service date has changed from 1993 to 1995.

- Installed capacity has changed from 300 MW to 275 MW.

- Small changes to the design and locations of shoreline protective works.

- Daily reservoir level fluctuations limited to 2.0 m during March, April and May (previously March and April).

The above changes have been incorporated in the report only where they would affect the results of the impact assessment.

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SUMMARY

AGRICULTURE STUDIES

STUDY AREA AGRICULTURAL RESOURCES

The study area is situated in the southern reaches of the Columbia River Valley within the West Kootenay region. This portion of the Columbia River Valley lies between the major mountain ranges of the Monashees to the west and the Selkirks to the east and is characterized by steep side slopes and a narrow valley bottom.

Three major landform types comprise most of the arable resource base found in the area. The most extensive feature consists of the remnant glaciofluvial terraces deposited during the glacial period and since eroded by the action of the Columbia River and its tributary streams and channels. The other landform features of significance to agriculture are the recent river terraces, particularly those found at the confluence of the Kootenay and Columbia Rivers, as well as the fluvial fans of the many minor tributaries of the Columbia.

DEVELOPMENT OF AGRICULTURE IN THE STUDY AREA

Historically, agriculture in the study area has reflected the development trends occurring in the broader regional context.

SUMMARY

From the beginnings of commercial agriculture before the turn of the century, the area has progressed through the same major phases of limited local supply orientation, communal Doukhobor development, collapse and withdrawal, declining horticultural viability, and increasing use of agricultural land for hobby farm and rural residential activity. Historically, horticultural activity has been the major agricultural focus in the study area, and this is likely to remain so in the event of any major agricultural renewal that could occur in the area in the future. While some forage production will always be present, much of the area's arable base is much more suited to horticultural production.

INVENTORY OF STUDY AREA AGRICULTURE

According to the detailed inventory of the agricultural resources and their present utilization carried out in this study, it is estimated that the study area contains about 1,132 ha within the agricultural land reserve (ALR). Two thirds of this land is classified as arable (within BCLI Classes 1-5) and almost half of this area can be termed prime agricultural land (BCLI Classes 1-3) capable of supporting a wide range of alternate cropping enterprises.

Although as much as half of this ALR area may have been cultivated at one time or another since the turn of the century, present commercially oriented cultivation occurs on only about 20 hectares, less than 2% of the ALR area. Much of the rest of the formerly cultivated areas has been abandoned or has been converted to hobby farms, rural residential use, built-up areas, or has otherwise been developed or retained for urban related uses.

The remaining half of the ALR lands have not been developed and remain largely covered by shrubs and mixed wood forests.

Table S.1 provides a summary of the capability and present use of lands found within the study area's agricultural land reserves.

POSSIBLE PROJECT IMPACTS ON AGRICULTURE

Three major areas of possible agricultural impacts are evident in the study area: the Kootenay confluence/Brilliant area, the Champion Creek terrace area and the Birchbank terrace area. One other minor area of possible impact lies to the south of Cai Creek in sub-area 6 (refer to Figure 1.1). In all of these sub-areas, possible impacts consist largely of potential inundation of arable land due to the project. Additionally, in sub-area 7 a farm access road may be inundated.

The Pass Creek sub-area contains a significant amount of ALR lands potentially affected, but little agricultural impact is envisioned.

No other agricultural impacts are predicted for sub-areas 1, 2, 5, 8, or 9 as no arable lands are directly affected.

Table S.2 details areas of ALR lands potentially inundated by the project at each of the three reservoir elevations considered, for each sub-area as well as the study area in total. Both the agricultural capability and present land use of potentially affected areas are addressed. A total of 83 ha of ALR lands are potentially affected at the proposed reservoir elevation of EL 424 m, and 155 ha and 209 ha would be affected at EL 427 m and EL 430 m, respectively, two alternate reservoir

Table S.1

SUMMARY OF STUDY AREA AGRICULTURE

Agricultural Capability of Study Area Lands within the Agricultural Land Reserve

AGRICULTURAL CAPABILITY CLASS	AREA (ha)	% TOTAL
1	-	-
2	280	25
3	216	19
4	228	20
5	38	3
6	77	7
7	237	20
UNCLASSIFIED	56	5
TOTAL	1132	100

Present Land Use of Study Area Lands within the Agricultural Land Reserve

LAND USE	AREA (ha)	% TOTAL
HORTICULTURE	-	-
FORAGE	20	2
DECADENT ORCHARD	187	16
CLEARED LAND/GRASSLAND	186	16
HOBBY FARM/ RURAL RESIDENTIAL	63	6
BUILT UP	114	10
OTHER	562	50
TOTAL	1132	100

Table S.2

SUMMARY OF AREAS OF AGRICULTURAL LAND
RESERVE AREAS POTENTIALLY INUNDATED

Potential Area Inundated, in Hectares,
by Agricultural Capability

AGRICULTURAL CAPABILITY CLASS (BCLI)	RESERVOIR LEVEL		
	424 m	427 m	430 m
1	-	-	-
2	39	66	75
3	6	12	29
4	9	31	43
5	3	6	7
6	4	7	11
7	22	33	44
TOTAL	83	155	209

Potential Area Inundated, in Hectares, by Present Land Use

LAND USE	RESERVOIR LEVEL		
	424 m	427 m	430 m
HORTICULTURE	-	-	-
FORAGE	14	18	18
DECADENT ORCHARD	2	25	34
CLEARED LAND/GRASSLAND	3	15	29
HOBBY FARM/RURAL RESIDENTIAL	4	7	10
BUILT UP	7	11	11
OTHER	53	79	107
TOTAL	83	155	209

levels initially assessed in the environmental studies. About three-quarters of these amounts represent arable lands, the greatest portion of which are high capability Class 2 and 3 lands.

Very little of the arable land potentially affected is presently used for commercial agriculture. At EL 424 m only 14 ha of potentially affected lands support commercial hay production, and most of this is non-intensive. However as much as half the area potentially affected may have been cultivated at some time in the recent past. These lands have since been abandoned or have moved into alternate uses, such as hobby farms, rural residential areas, and built-up areas. About half of the land potentially affected has never been developed for agriculture. Some of this land is non-arable and most of it is forested. For the most part, the non-arable portions are not suited to livestock grazing for reasons more related to land tenure patterns than to a lack of biophysical capability.

Two areas of possible construction-related agricultural impacts have been identified. In sub-area 9, proposed works would occupy a total of approximately 19 ha of undeveloped arable land within the ALR. With reclamation, this area could be eventually returned to the resource base. In sub-area 10, approximately 3 ha of undeveloped arable land within the ALR would be occupied by the proposed relocation of the railway in the Birchbank area. This potential impact would be permanent. No other significant agricultural impacts related to project construction activities were identified in the other sub-areas.

The possibility of some agricultural impacts related to potential bank erosion due to increased water levels created by the proposed project has been identified. However, because of the highly speculative nature of these potential impacts, and

the minor amounts of land that may be involved, no further attempt has been made to define agricultural impacts.

A few speculative but possible impacts affecting the operation of future agricultural enterprises have been identified. These are difficult to confirm and would only be of minor significance.

No impacts were assessed for ancillary project works not defined at the time of writing.

AGRICULTURAL IMPACT EVALUATION

An economic analysis of potential agricultural production indicates that up to $13,000 of future annual agricultural net income would potentially be lost due to inundation at the proposed reservoir level of 424 m. At the alternate 427 m and 430 m elevations initially considered, annual agricultural net income foregone is estimated to be $25,000 and $29,000, respectively. These figures are expressed in 1980 dollars.

REGIONAL IMPACTS

The loss of current production on potentially affected arable lands would have an insignificant impact on the region's agricultural economy.

This, however, is not entirely the case when future agricultural production potential is considered. The proposed project could affect about 9% of all the prime agricultural land (Classes 1-3) found in the study area, including some of the few developable, high capability lowland sites suited to

intensive horticultural production that remain in the Columbia River Valley south of Nakusp.

In a wider regional context, of course, this potential impact becomes much more diluted. The maximum total area of prime agricultural land affected by the project represents only about one-tenth of one percent of all prime agricultural land found in the West Kootenay region.

MITIGATION OPPORTUNITIES

Opportunities for mitigating possible agricultural impacts which should be considered include reclamation of disturbed agricultural lands, flood protection for some arable areas, provision of alternate farm access, avoidance of arable lands when locating project works, bank stability works where indicated, and a lands acquisition policy designed to minimize alienation of agricultural land.

CHAPTER 1

INTRODUCTION

This study arose in response to a request, dated March 13, 1980, by the Generation Planning Department of B.C. Hydro for proposals to carry out the agriculture components of the detailed feasibility assessment of the proposed Murphy Creek Hydroelectric Project. In a letter of confirmation, dated April 24, 1980, Talisman Land Resource Consultants were contracted to provide these services.

Talisman personnel principally responsible for the agricultural studies and impact assessment carried out in this project were pedologists Paul Christie, P.Ag., and Susan Ames, M.Sc.; and agricultural economists Ted Horbulyk, P.Ag., and Dan Schroeter, P.Ag.

Paul Christie functioned as project director for all the work carried out within this study. While each researcher was responsible for writing his or her relevant sections, Dan Schroeter acted as the editor of the report.

The terms of reference for the agricultural studies (see Appendix A) require both an inventory of the resources and industry of the study area and region, and an assessment of the

short and long term impacts of the proposed project on present and future agricultural activity. The terms of reference also call for identification of opportunities for mitigating any adverse impacts caused by the project.

The agricultural studies concern not only the effects of the project on the present agricultural activity found in the area, but also the effects on the agricultural resource base, which ultimately defines the maximum future agricultural use of the area.

The study area for the agricultural studies consists of all lands below elevation (EL) 500 metres above sea level (a.s.l.) adjacent to the Columbia and Kootenay Rivers and within the limit of the available photomosaic mapping, from immediately downstream of the proposed damsite near Oasis, B.C., upstream on the Columbia River to the Hugh Keenleyside Dam, and upstream on the Kootenay River to the Brilliant Dam (see Figure 1.1).

To facilitate the understanding and use of this report, the detailed study area inventory and impact assessment that follows is presented by ten sub-areas, as well as for the total study area. The sub-areas, also shown on Figure 1.1, are as follows:

Sub-Area 1: Columbia River North (Hugh Keenleyside Dam to Robson)
Sub-Area 2: Columbia River South (Hugh Keenleyside Dam to Castlegar)
Sub-Area 3: Pass Creek
Sub-Area 4: Kootenay River
Sub-Area 5: Castlegar - Kinnaird
Sub-Area 6: Castlegar Airport
Sub-Area 7: Champion and Jordan Creeks

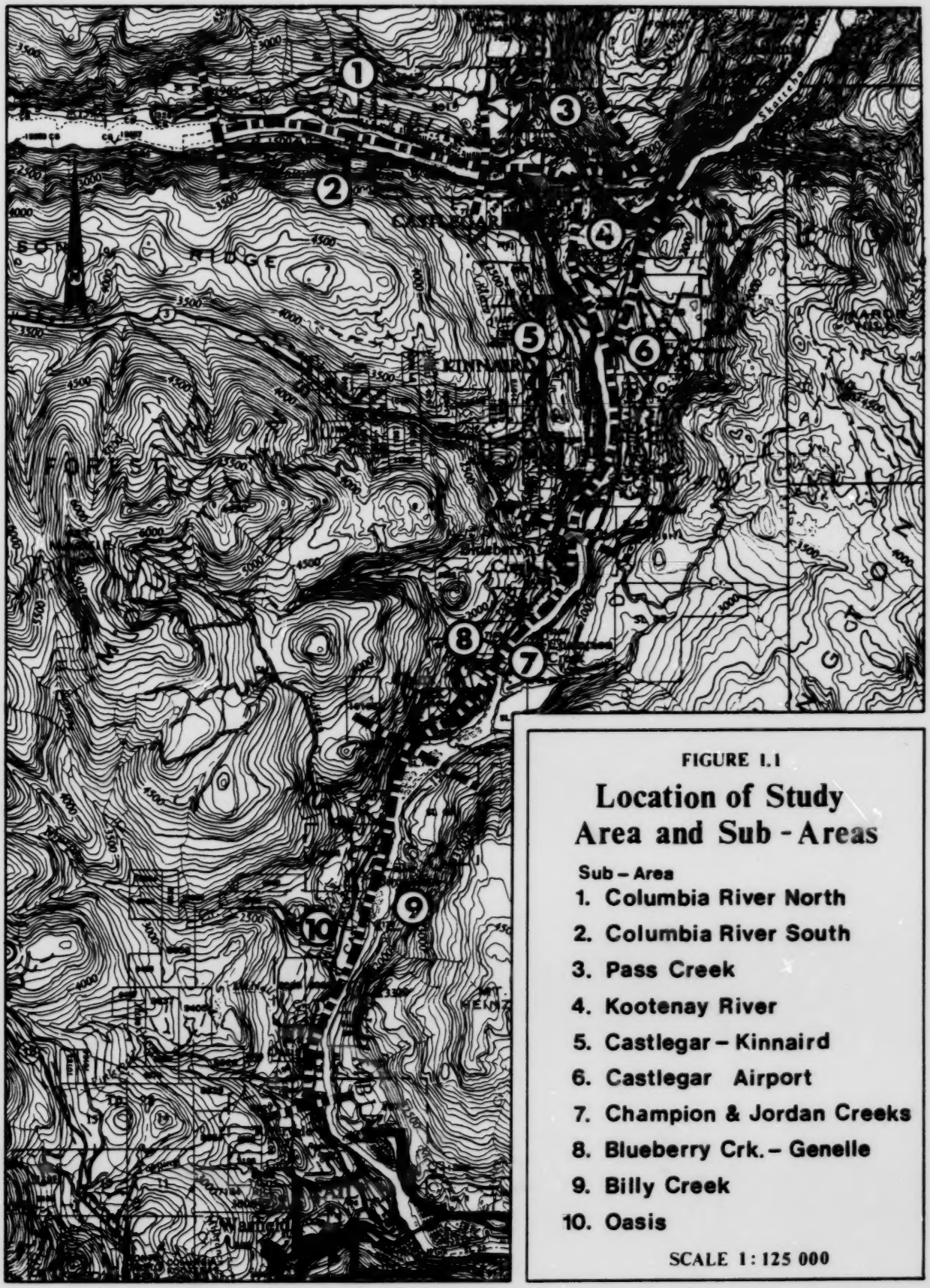


FIGURE 1.1

Location of Study Area and Sub - Areas

Sub – Area

1. Columbia River North
2. Columbia River South
3. Pass Creek
4. Kootenay River
5. Castlegar – Kinnaird
6. Castlegar Airport
7. Champion & Jordan Creeks
8. Blueberry Crk. – Genelle
9. Billy Creek
10. Oasis

SCALE 1 : 125 000

INTRODUCTION

Sub-Area 8: Blueberry Creek - Genelle
Sub-Area 9: Billy Creek
Sub-Area 10: Oasis

The report that follows is the fifth draft of the Murphy Creek agricultural studies and supercedes all previous drafts. This draft has been revised to incorporate responses to relevant review comments by B.C. Government and B.C. Hydro reviewers. The basis on which this report was written remains the program of field work and data compilation that was carried out in the summer of 1980. All present land use information portrayed in the report is based on observed use as of that date.

The following report is presented in three chapters. Chapter 2 provides a background description of regional agriculture, Chapter 3 documents a detailed inventory description of study area agricultural resources and use, and Chapter 4 presents an assessment of the possible impacts that the proposed hydro-electric project would have on future agricultural activity. A set of appendices follows Chapter 4.

The reader is also referred to the Resource Atlas for this project prepared by Thurber Consultants Ltd. It contains the agriculture mapping that was carried out in the inventory phase of this study.

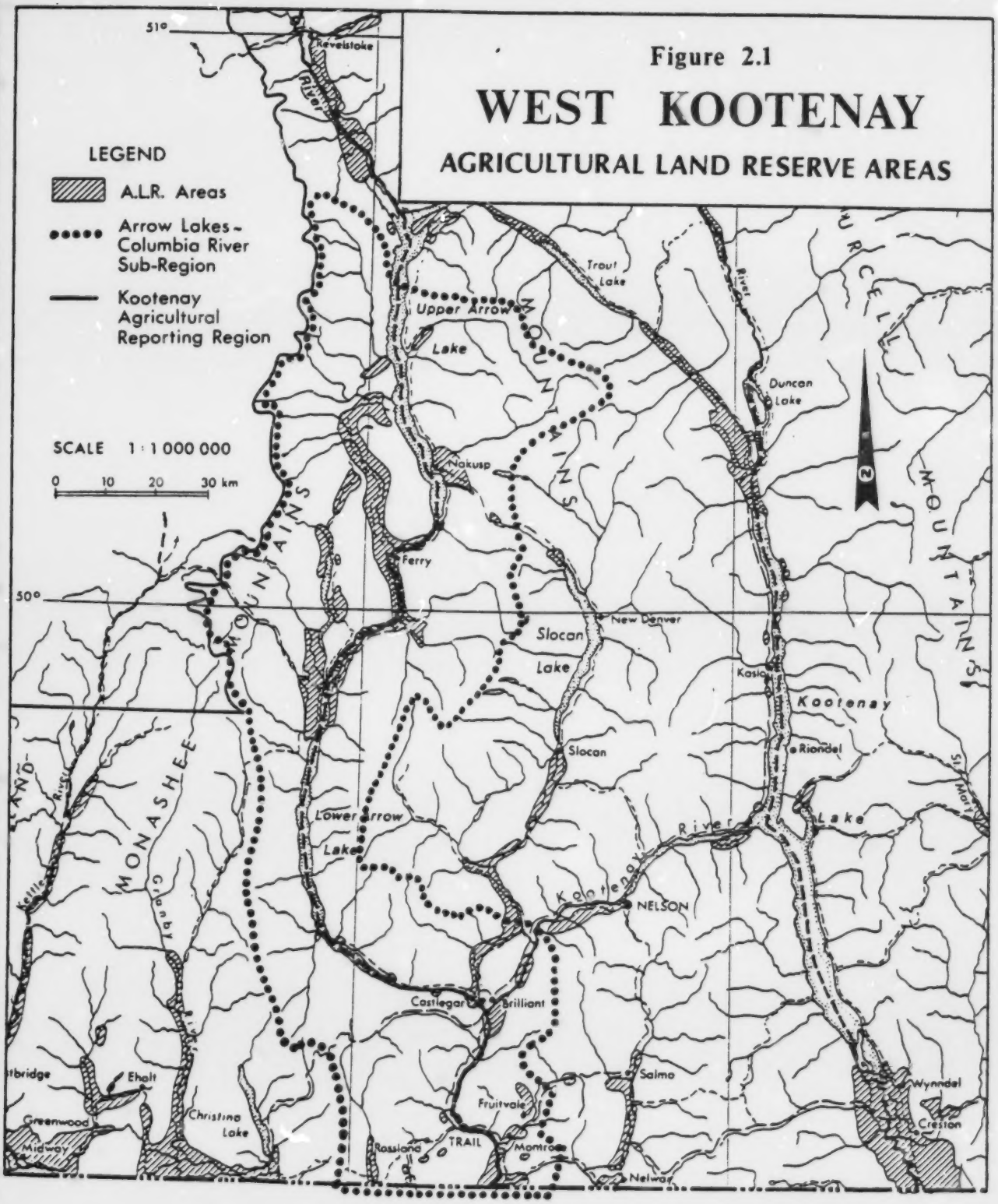
CHAPTER 2

REGIONAL AGRICULTURE OVERVIEW

Before proceeding with a detailed description of the agricultural resource base and present agricultural utilization of the Murphy Creek Hydroelectric Project study area, it is useful to gain an understanding of the regional context within which study area agriculture operates. This chapter presents an overview of agriculture within the West Kootenay region and the Arrow Lakes - Columbia River sub-region in which the study area is situated (Figure 2.1).

AGRICULTURAL LAND RESOURCES

Regionally, the arable land resource base and historical cultivation patterns occur chiefly along the terraces, floodplains and tributary fans associated with the major river valleys. The sideslopes and uplands are generally non-arable although in many parts of the West Kootenays these dominantly forested lands support grazing by domestic stock.



Source : Inventory of Agricultural Land Reserves in British Columbia by the Select Standing Committee on Agriculture. 1978.

REGIONAL AGRICULTURE OVERVIEW

Climatic Capability for Agriculture

The improved (irrigated) climatic capability rating for agriculture in the West Kootenay region is Class 1 using B.C. Land Inventory (BCLI) classification methodology. Generally the region is drier to the west and wetter near the eastern boundary. For example, Grand Forks which is one of the major agricultural centres in the region and which lies on the western boundary, has an unimproved climate rating of Class 6 with limitations due to aridity. Creston, also a major agricultural area in the region, lies on the eastern boundary, and has an unimproved rating of Class 5 with limitations also due to moisture deficiencies but to a lesser degree than in the Grand Forks area.

Because these ratings indicate that no cultivated crop production can occur without irrigation beyond limited dryland production of forages, irrigated ratings have generally been used in this report when assessing future agricultural potential. Although water sources for potential irrigation use are not available throughout the study region, within the study area it is reasonable to assume water availability.

The study area is geographically located between Creston and Grand Forks and has a climate which is median between the two areas. The unimproved climatic capability for agriculture rating, based on information from the Trail (Warfield) station, is Class 5 with aridity limitations. This area experiences a droughty period between May and September during which the average precipitation is between 180 and 230 mm. This indicates a moisture deficiency during the growing season of about 270 mm. The improved or irrigated rating is Class 1 with a freeze-free period of roughly 184 days and growing degree days (above 5°C) of approximately 2,170 (B.C. Ministry of

the Environment, 1978). The study area experiences warm summer months with average July temperatures of 21°C and fairly mild winters with January temperatures averaging -4°C (Province of British Columbia Land Service, 1974).

Land Capability for Agriculture

The most extensive, higher capability lands within the West Kootenay region occur along the Kootenay River floodplain at Creston and in the vicinity of Grand Forks. These lands are composed of finer textured fluvial and glaciolacustrine deposits and, using BCLI classification, are rated dominantly within irrigated Classes 1 to 3. Extensive lower capability lands, occurring throughout the region in association with the major river valleys and their tributaries, are composed of morainal deposits. These lands are generally rated within irrigated classes 4 and 5 with limitations due to stoniness, low moisture holding capacity and topography.

Smaller pockets of higher capability lands occur throughout the region and within the study area and are generally composed of finer textured, level to gently sloping fluvial, glaciolacustrine and alluvial fan deposits along the major valleys and their tributaries.

Due to a severe moisture deficiency during the growing season almost all of these lands require supplemental irrigation for cultivated crop production. Exceptions to this are the extensive floodplain deposits in the vicinity of Creston, and other localized floodplain deposits within the study area and throughout the region that benefit from the natural sub-irrigation effects of a high water table.

At higher elevations along the major valleys and throughout the mountain ranges and high plateaus of the region, climatic and soil limitations restrict agricultural capability and limit use to livestock grazing. Generally speaking, beyond the open and semi-open lower elevations, the carrying capacity for livestock grazing is very low.

AGRICULTURAL LAND USE

The use of land for agriculture in the study region is characterized by comparatively small holdings run on a part-time basis. Although the total area of arable land available for crop production is relatively limited, a large portion of it, some of which was historically cultivated, remains undeveloped and available for future agricultural use. The agricultural industry in the study area and in the larger West Kootenay region can best be explained in terms of its historical development, its current importance, and its projected future development.

Historical Development

Commercial agriculture in the West Kootenay region dates back to the 1880's and 1890's when the establishment of silver and lead mines throughout the region created a local demand for fresh meat and vegetables.

In 1908, a large group of Doukhobors, a religious sect of Russian background, migrated to the area from Saskatchewan and established settlements at Brilliant, Ootischenia (from the area presently occupied by the Castlegar Airport extending southwards to the Champion Creek fan), and elsewhere along the

valleys of the Kootenay and Columbia Rivers. The Doukhobors set up a substantial communal organization and jointly purchased a large area of land (over 5,000 hectares) which they settled in a system of communal villages, each of which supported about 60 people. They cleared and broke land, developed irrigation systems, and established large areas of orchards.

The promotional activities of several land development companies attracted many English settlers to farms in the area about that time. Crop production in the region became more land intensive and commercially oriented. Beef cattle production also gained importance, although to a lesser extent in the Columbia River Valley where limited rangeland was available.

The agricultural industry in the area flourished until the 1930's when a combination of production problems (irrigation difficulties, poor crop years due to climate, an outbreak of little cherry disease) and associated as well as external financial difficulties forced the Doukhobor communes into collective bankruptcy. The jointly owned lands were taken over by the Crown under the terms of the Doukhobor Land Act of the B.C. Legislature in 1939 and were subsequently redistributed to private titleholders on a piecemeal basis. Many of the skilled farmers left the industry or the area, and large areas of cultivated land were abandoned, or diverted to mixed and part-time farming away from commercial production. Lagging activity in the area's other resource industries, mining and forestry, did not encourage continued agricultural development or resumption of production.

A tree fruit packing house was cooperatively run in the Robson area until the late 1940's, when declining tree fruit acreages

were insufficient to support its continued operation. Development of better road transportation served as the impetus for a gradual shift in land use to more extensive activities such as cattle and forage production. Other more productive regions such as the Okanagan Valley were able to supply the region with large volumes of fruits and vegetables at the expense of less efficient producers in the West Kootenay area.

Although the local markets in the study area are now larger than when produce was grown locally, the region is now a net importer of fruits and vegetables. The limited land base under cultivation has not warranted the establishment of packing, storage, transportation, or marketing facilities that would facilitate the development of such production for local use. Those horticultural producers currently in business operate on a small scale on a part-time basis, and sell privately or through small outlets instead of through established marketing agencies. A cooperative tree fruit packing house facility was opened in 1975 in Creston (a distance of 120 km from Castlegar) and is the only such facility in the region.

Present Use

Agriculture in the West Kootenay region is largely concentrated in the Grand Forks area and on the Kootenay River lowlands at Creston. The Arrow Lakes area and Columbia River south to the international boundary are considerably less utilized at the present time for crop and livestock production.

By combining census data collected for Census Subdivision A of the Central Kootenay Census Division and Subdivision A of the Kootenay-Boundary Census Division, a profile of agriculture can be developed for this Arrow Lakes-Columbia River sub-region.

REGIONAL AGRICULTURE OVERVIEW

These data will cover production in such areas as Nakusp, Castlegar, Fruitvale and Montrose, and will include all of the Murphy Creek study area.

The 1976 Census of Agriculture collected data from agricultural holdings larger than 0.4 hectares (1.0 acre) with total sales of $1,200 or more in 1975. In the Arrow Lakes-Columbia River sub-region defined by the Census subdivisions, there were 66 farms in 1976, with a farm population of 212. Based on a population in the sub-region of almost 37,000 people including the cities of Castlegar and Trail, only one half of one percent of the population lives on farms.

Census farms in this sub-region occupy about 5,800 hectares of which slightly more than one third (2,000 hectares) is improved. The average farm occupies about 90 hectares, compared to a B.C. average of twice that size (180 ha.). Only one fifth of one percent (0.2%) of British Columbia's total crop acreage is found in this sub-region. The principal crops grown are forage and fodder crops, which, in decreasing order of land area occupied, amount to: tame hay (87%), oats for fodder (5%), and corn for silage (2%). Fruits, vegetables, nursery crops, and greenhouses occupy less than 3% of the crop area, or about 25 hectares.

The principal livestock enterprise in the sub-region is the production of beef cattle. The average number of cattle kept per farm is about 40 head which compares to a provincial average of 50 head per farm. Fifteen percent of the cattle are raised principally for dairy use. Other stock such as sheep and pigs are not found in significant numbers.

The Inventory of Agricultural Land Reserves prepared for the B.C. Select Standing Committee on Agriculture (SSCA) in 1979,

summarizes the use and capability of all lands reserved for agricultural use. These data can be tabulated to generally approximate the Arrow Lakes-Columbia River sub-region defined by the Census data. Whereas Census data show use of established farms with minimum specified annual product sales, the SSCA data provide information on all lands in the agricultural land reserve (ALR), and thereby encompass potentially cultivable lands and arable lands used for hobby farm and rural residential use.

Agricultural land reserves in the Arrow Lakes-Columbia River sub-region encompass almost 28,000 hectares. About 95% of this area is considered arable, that is, it falls within BCLI Land Capability for Agriculture Classes 1 - 5 which by definition are capable of sustained arable culture. While Class 1 lands comprise less than 3% of the ALR, Classes 2, 3, and 4 make up 32%, 30% and 23% respectively. Class 5 areas, capable of sustained forage production only, comprise 7% of ALR lands. Most of the remaining areas are suitable only for grazing use. About 2% of the ALR has no agricultural capability.

Based primarily on 1976 aerial photography, the SSCA reports that about 10% of the ALR land area (2,800 hectares) is used for the cultivation of forages and grains. Horticultural crops (fruits, vegetables, and nursery crops) occupy less than 1% of the ALR. Open grassland areas account for up to 12% of the ALR area, some portion of which may be used as unimproved pasture or rangeland. Almost three-quarters of the ALR land is under forest cover and may be currently managed for timber production and may be in some form of forest reserve. Other forested areas, however, appear to offer good potential for the expansion of agricultural crop production. More than 70% of the ALR is both arable (BCLI Classes 1 - 5) and forested.

REGIONAL AGRICULTURE OVERVIEW

A comparison of SSCA data (Table 2.1) to the Census data reveals a difference of about 25% in the estimates of areas under cultivation in the sub-region. This may be due to inclusion by the SSCA of hobby farms and small holdings not included in the Census statistics, due to slight differences in area boundaries, or due to other differences in methodology. Both sources confirm forage production to be the most important cropping activity in the region, and both show very little horticultural activity. Additionally, the SSCA data reveal that the agricultural land reserves in the study area contain eight or nine times as much arable land as is currently cultivated, and that most of this is currently under forest cover.

Expansion of regional agricultural production into forested areas would incur high initial development costs for land clearing and preparation. Supplemental irrigation is required through most of the area to achieve optimal yields, and drainage may be required in a few areas. Expansion of crop production is likely to occur on these lands only where the ready availability of an irrigation source, or the availability of a large contiguous land area is seen as advantageous to prospective producers. Otherwise, increases in total crop production are more likely to come from better utilization of previously and currently cultivated areas, which generally enjoy better market access and lower development costs.

Some previously cultivated ALR lands are in demand for hobby farm and rural residential use. In many cases, the market value of these lands is based on residential and speculative demands above their value in agricultural production. This is often the case with lands previously subdivided into smaller legal parcels. To the extent that this occurs, the availability of many of these smaller parcels for commercial agriculture is significantly reduced.

TABLE 2.1

ARROW LAKES - COLUMBIA RIVER SUB-REGION[a]

Agricultural Land Reserve Areas, in Hectares, by:
Capability Class and Present Land Use

PRESENT LAND USE	BCLI LAND CAPABILITY FOR AGRICULTURE CLASS										
	1	2	3	4	1-4	5	6	7	water	TOTAL	%TOTAL
FORAGES AND GRAINS	190	1350	670	390	2600	120	50	30	0	2800	10
HORTICULTURE	10	40	20	50	120	0	10	0	0	130	0
GRASSLAND AND PASTURE	170	1060	970	760	2960	170	170	50	0	3350	12
FOREST	490	6390	6250	5060	18190	1280	560	410	0	20440	74
NON-PRODUCTIVE LANDS	20	190	150	180	540	400	10	10	70	1030	4
TOTAL	880	9030	8060	6440	24410	1970	800	500	70	27750	
%TOTAL	3	32	30	23	88	7	3	2	0		100

[a]Compiled from source data provided by the Select Standing Committee on Agriculture. Agricultural Land Reserves: Agricultural Capability and Land Use (Maps No. 82E16, 82F4, 82F5, 82F13, 82K4, and 82K5), Scale 1:50,000. 1979. Victoria: Surveys and Mapping Branch, B.C. Ministry of Environment.

In summary, the agricultural industry in the Arrow Lakes-Columbia River sub-region of the West Kootenays was once greater in relative importance and total area cultivated than at present. Agricultural production has become less land intensive and principally consists of forage crops and beef cattle. Large areas of ALR land are available for the expansion of production although in some areas there is competition for forestry, residential, and hobby farm (non-commercial agriculture) use. The growing markets in the area are currently being served by competing sources of supply such as Creston, Grand Forks, and the Okanagan Valley.

Projected Use

While it is impossible to predict future developments in regional agricultural production, several trends or influences can be identified that are expected to continue.

The markets to be served in the Castlegar and Trail areas are expected to continue growing, and there is potential to produce much of the fruit and produce they will require locally. Outside sources of supply (principally the Okanagan Valley) do not have the same reserves of potentially cultivable lands and will be facing greater demands from their other markets.

A study prepared by the B.C. Department of Economic Development in 1976 predicts that in the absence of any new economic incentives by the government, some marginal increases in primary agricultural production are expected to occur in the Arrow Lakes sub-region. These are expected to be long-term developments in response to growing product demand.

REGIONAL AGRICULTURE OVERVIEW

If a program of increased government assistance was made available to primary agriculture then the rate at which new land is brought into production within the region could be increased and existing production could be sustained. With the present emphasis that the Provincial Government, with support from the Federal Government, is putting on increasing provincial agricultural self-sufficiency in general and beef production in particular, such a scenario of increased government assistance seems possible, and considerably higher levels of agricultural activity could result in the region.

The trend of settlement and development of smaller parcels is expected to continue in the short term, as people develop small acreages for rural residences and hobby farms. Some of these may start to produce crops and livestock for commercial sale on a part-time basis to supplement off-farm income or as a transition to retirement. This type of development will be limited in some areas by the lack of irrigation water or by the lack of holdings of suitable parcel size.

The following chapter assesses current and potential crop production in each of ten study sub-areas based on an examination of land capability and present and historical use. A summary is then presented for the whole study area.

CHAPTER 3

STUDY AREA AGRICULTURE

This chapter presents detailed descriptions of the agricultural resources and present agricultural use of each of the ten defined sub-areas of the study area. Before proceeding to these descriptions the following section provides a perspective on the nature of the area's agricultural base and activity relative to the regional description presented in the previous chapter.

STUDY AREA PERSPECTIVE

Physical Setting and Major Features

The study area is situated in the southern reaches of the Columbia River Valley within the West Kootenay region. This portion of the Columbia River Valley lies between the major mountain ranges of the Monashees to the west and the Selkirks to the east and is characterized by steep side slopes and a narrow valley bottom.

Three major landform types comprise most of the arable resource

base found in the area. The most extensive feature consists of the remnant glaciofluvial terraces deposited during the glacial period and since eroded by the action of the Columbia River and its tributary streams and channels. These terraces vary from level to gently sloping and occur at many different elevations between 440 m and 580 m. Surficial materials are very coarse textured and drainage is rapid. Smaller pockets of finer textured glaciolacustrine material are found complexed with the glaciofluvial materials in isolated occurrences.

A second landform feature of significance consists of recent river terraces generally located below EL 433 m. The largest of these are the recent terraces found at the confluence of the Kootenay and Columbia Rivers. Other, much smaller terraces occur as narrow deposits along the banks of the Columbia. These units are usually level and very coarse textured. Although they are moderately well to well drained, portions at lower elevations incur natural sub-surface irrigation due to a high water table.

The fluvial fans of the many minor tributaries of the Columbia comprise a third landform type of note to agriculture. These fans vary from gently to strongly sloping and exhibit extremely coarse textures and high coarse fragment content.

Role of Study Area Agriculture within the Region

Historically, agriculture in the study area has reflected the development trends occurring in the broader regional context. From the beginnings of commercial agriculture before the turn of the century, the area has progressed through the same major phases of limited local supply orientation, communal Doukhobor

development, collapse and withdrawal, declining horticultural viability, and increasing use of agricultural land for hobby farm and rural residential activity. Unlike the broader region, the study area has rarely seen much emphasis on cattle production, for the most part due to the limited available rangeland base. This situation has been reinforced in recent decades, as the limited rangeland base has been largely rendered unusable due to settlement and land development. Within the study area today, only a few small scale livestock enterprises are carried out, using small, usually privately owned pasture areas for livestock grazing.

Historically, horticultural activity has been the major agricultural focus in the study area, and this is likely to remain so in the event of any major agricultural renewal that could occur in the area in the future. While some forage production will always be present, much of the area's arable base is much more suited to horticultural production.

The following sections provide detailed, specific descriptions of agriculture found in each of the ten defined sub-areas of the study area. While all agricultural activity and resources documented within the study area are described in these sections, whether inside or outside the ALR, only ALR inventory information has been tabulated. Agricultural resources and use outside the ALR are very limited and are not projected to incur significant impacts as a result of the proposed project.

STUDY AREA AGRICULTURE

SUB-AREA 1:
COLUMBIA RIVER NORTH (HUGH KEENLEYSIDE DAM TO ROBSON)

Terrain and Soils

Soils in this sub-area have developed dominantly from glaciofluvial materials in the form of fans and terraces deposited at the base of bedrock exposures along the Columbia River. Many of the fan and terrace areas are relatively steeply sloping. The terrace on which Robson is located is banked by steep slopes but the terrace surface is relatively level. Parts of this terrace lie adjacent to morainal deposits which are more steeply sloping.

Field observations indicate that the soils in this sub-area are developed generally on gravelly, sandy parent materials which often contain a cobbly and bouldery component. All of these soils are well drained.

Land Capability for Agriculture

Field inspection suggests that the soils with the highest rating in terms of agricultural capability occur on the terrace on which Robson is located. These soils are rated Class 3 (irrigated) with limitations due to moisture, stoniness, and topography. Most of the other soils in this sub-area are Classes 4 and 6 depending on the degree of the limitations due to topography and stoniness. Moisture is also a limitation for these soils.

The soils rated Class 3 are capable of producing some vegetables such as potatoes, rutabagas, cabbage and brussels

sprouts as well as tree fruits, small fruits, such as raspberries and strawberries, cereals, and forage crops.

The Class 4 soils are capable of producing tree fruits, cereals and forage crops.

The soils rated Class 6 are suitable only for grazing. Bedrock exposures have been rated as Class 7 and have no agricultural capability.

Present and Historical Use

The Columbia River North sub-area contains the only commercial orchards remaining in the study area. However, this land was excluded from the agricultural land reserve in 1978, and is predominantly residential. There is additional pressure for development in the area, and a secondary road has been proposed which could fractionate existing agriculture even further.

There are four commercially operated orchards in the sub-area totalling about 8 hectares with between 1.6 and 2.4 hectares of fruit trees on each. All of the orchards are run as part-time enterprises and are composed largely of apple and peach trees. These orchards appear to have been established with roadside sales in mind, as they contain many types of fruit and many varieties of each type. This allows harvesting and marketing of fruit over a longer period without the need for special storage facilities. These enterprises are therefore not well suited for volume deliveries of uniform fruit to a packing house.

For 1979 (last production year for which information was available), the owners of these orchards reported average yields of

8.0 t/ha for apples, 4.0 t/ha for peaches, and 1.6 t/ha for pears (one producer reporting). These yields are very low by commercial standards, reflecting the low intensity operations surveyed in the area. Total production from these four producers in 1979 is estimated at 28 t of apples and 9 t of peaches, as well as a few tonnes of assorted other fruits including pears, cherries and prunes. Total gross farm value of production was probably in the order of $20-25,000.

According to area orchardists, there were once up to one hundred hectares of tree fruits grown in this sub-area, which supported the operation of a cooperative packing house. Now, the nearest packing house is in Creston, 120 km away, so fruit is usually sold privately. One producer regularly sells through a chain of local retail outlets while others sell to roadside customers,. including in some cases their own clientele of return customers from areas such as Kaslo, Nelson, Rossland and Trail.

The Robson area contains roughly nine hectares of land previously used as orchard, now occupied by decadent trees. About 16 hectares of land are devoted to large residences and hobby farms which often contain producing fruit trees kept for the owners' own use. Some of these properties may also be used to keep small numbers of horses, cattle, and poultry, but they are all limited in land area that could potentially be cultivated. In this sub-area grazing by livestock is confined to these small private areas.

Most of the sub-area that was previously cultivated or that has agricultural capability has been sub-divided and developed such that the area is not considered suitable for any significant expansion of commercial agriculture.

STUDY AREA AGRICULTURE

All areas of present agricultural use within this sub-area, including hobby farm areas, are indicated on Map 1 in the Cultural Resources series in the Murphy Creek Project Resource Atlas (Thurber, 1981).

SUB-AREA 2:
COLUMBIA RIVER SOUTH (HUGH KEENLEYSIDE DAM TO CASTLEGAR)

Terrain and Soils

This area is dominated by bedrock, which is generally steeply sloping, complexed with colluvium and morainal materials. Narrow, level, recent river terraces, which are mostly in industrial use, skirt the bedrock unit. A few small cleared areas, proximate to the eastern boundary of the sub-area are in agricultural use. These terraces are level but exhibit minor channel erosion. The soils are developed on sand overlying gravelly sand and are rapidly drained.

Minor areas in agricultural use also occur at the base of the bedrock unit. These are classified as fluvial fan deposits. The slopes are steep, about 18%, and the soils are rapidly drained, gravelly sands.

One non-bedrock, arable unit at about EL 550 metres, occurs in the vicinity of sub-area 2 and extends above the Castlegar-Kinnaird sub-area 5. This area, which is in the ALR, is described in the sub-area 5 discussion.

STUDY AREA AGRICULTURE

Land Capability for Agriculture

The soils with the highest capability for agriculture are those which occur on the sandy, level, recent river terraces. These soils have an improved agricultural capability rating of 2 with minor limitations due to low moisture and fertility status and erosion. These soils are capable of producing a wide range of crops which includes many vegetables, tree fruits, small fruits, cereals and forages. The soils occurring at the base of the bedrock unit are rated as Class 5 with limitations due to topography, stoniness, and low moisture holding capacity. These soils are suited to hay production and grazing only.

Present and Historical Use

Sub-area 2, Columbia River South, is currently the site of one small hobby farm (about 3 hectares), and is otherwise unused for agriculture. Given the limited base of capable land it is unlikely that this area could support commercial land-based crops or livestock production. There are no ALR areas contained in this sub-area.

No grazing activity was observed or documented within this sub-area, which consists largely of industrial land and vacant private land.

The hobby farm found in this sub-area is shown on Map 1 of the Cultural Resources series in the Resource Atlas.

SUB-AREA 3: PASS CREEK

Terrain and Soils

The land placed in the agricultural land reserve in the Pass Creek sub-area consists of a recent river terrace between EL 424 and 427 metres, through which Pass Creek flows, as well as an upper terrace largely above 500 metres, which consists of a complex of glaciofluvial material and a remnant lake (lacustrine) deposit. This upper terrace is generally level but is surrounded by steep slopes on its northern and eastern boundaries with bedrock outcropping on its western and southern boundaries. The area surrounding Pass Creek is dominantly level but channelling has resulted in some areas which are moderately sloping.

The soils occurring on the recent river terraces are Orthic Regosols developed on sandy parent material which may overlie gravels at shallow depths. Along the banks of the creek, boulders and cobble-sized fragments are common. These recent river terrace soils are moderately well drained and due to their low elevation receive some benefit from natural, sub-surface irrigation. This part of the sub-area also contains many small bodies of standing water which are related to Pass Creek.

The soils which occupy the glaciofluvial portion of the upper terrace are developed on gravelly sandy parent materials which are well drained. The soils located in the lacustrine portion of the terrace are developed on silty material. Due to their elevated position and the proximity of the steep slopes surrounding these soils, they are also well-drained.

Small parcels of land within the ALR below EL 500 metres exist north of the Pass Creek Regional Park and are beyond the area

covered by the project orthophoto base mapping. These units are dominantly in grassland and pasture use.

Land Capability for Agriculture

The soils occurring on the recent river terraces adjacent to Pass Creek have been classified as 70% Class 2 with limitations due to low moisture holding capacity, and 30% Class 4 with limitations due to topography and low moisture holding capacity. The soils rated as Class 2 are capable of producing a wide range of crops which includes most vegetables, as well as tree fruits, small fruits, cereals, and forage crops. Those rated as Class 4 are limited in the range of crops they are capable of producing and are most suited to forages and grains. The steeply sloping soils bounding the upper terrace have been rated as Class 7 with limitations due to topography. These soils are not considered capable of arable culture.

The parcels in the ALR which lie north of the Pass Creek Regional Park have an improved agricultural capability rating of Class 1. Soils in this class have no significant limitations to cultivation. They are capable of producing a wide range of field crops adapted to the region.

Present and Historical Use

The Pass Creek sub-area contains some arable land in the ALR, but none of the area is commercially farmed. There is a pattern of land holding in small parcels for residential and hobby farm uses. One large area of ALR land above EL 500 m is under forest cover and is not developed for agricultural use.

Outside the ALR, some hay production and grazing occur on institutionally-owned lands which might otherwise be unused. One property provides about two hectares of standing hay which is cut annually on a lease or crop-share basis without active management such as fertilization, irrigation, or reseeding. The land is apparently owned by the local school board, and various commercial and hobby farmers have contracted for the hay in recent years. An area of more than ten hectares is owned by Canadian Cellulose (B.C. Timber) and is leased on a year-to-year basis to an area rancher for cattle grazing through some portion of the year. No cultivation, fencing, or other improvements have been made in conjunction with this use. The rancher runs a small, part-time purebred Hereford operation (10-15 brood cows) in the Pass Creek Valley outside of the study area. This area represents the only portion of the study area that he uses for grazing. Some livestock grazing also occurs on the hobby farm areas within the ALR in this sub-area.

Sub-area Synopsis

Agriculture in this sub-area consists of a few hobby farm holdings within the ALR and some seasonal agricultural activity outside the ALR by absentee farmers. There are about 32 ha of land in the ALR, predominantly in land capability Classes 2 and 4. About 7 ha are occupied by hobby farms and rural residences, while the remaining area, mostly forested, supports no agricultural activity. Table 3.1 presents in detail the agricultural capability classification and present land use of all ALR lands in sub-area 3. These areas, as well as all areas of present agricultural use outside of the ALR, are depicted on Map 2 of the Cultural Resources series in the Resource Atlas.

Table 3.1

SUB-AREA 3: PASS CREEK

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	14	44	1
3	-	-	-
4	7	22	< 1
5	-	-	-
6	-	-	-
7	8	25	1
UNCLASSIFIED	3	9	< 1
TOTAL	32	100	2

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	-	-	-
CLEARED LAND/ GRASSLAND	1	3	< 1
HOBBY FARM/ RURAL RESIDENTIAL	7	22	< 1
BUILT UP	-	-	-
OTHER	24	75	2
TOTAL	32	100	2

SUB-AREA 4: KOOTENAY RIVER

Terrain and Soils

This sub-area consists of three major terrain units: a level recent river terrace on the Brilliant side of the Kootenay River, a similar terrace on the south side, and a glaciofluvial terrace, at a higher elevation, which extends into the confluence of the Columbia and Kootenay Rivers and upon which Selkirk College is situated.

The higher elevation glaciofluvial landform at 436 metres may be part of the glaciofluvial terraces which extend along the banks of the Columbia River. This unit is level and slopes steeply on its northern, western, and southern boundaries. A river terrace skirts the unit to the south, part of which has been highly eroded resulting in hilly topography with slopes ranging from 12% to 45%. The remainder of the lower terrace is level. Due to the active accretionary processes of the Columbia River, shifting sand bars border most of this lower terrace.

The eastern boundary of the glaciofluvial unit was less severely eroded with slopes ranging from 9-15%, leading to a gully which separates this unit from the Castlegar Airport sub-area which lies to the east.

North of the glaciofluvial unit the steep slopes are bounded by a series of channelled and eroded sandy river terraces, the lowest of which is 427 metres in elevation. Both this lower terrace and the Brilliant terrace are level overall but exhibit channel erosion in part with slopes ranging from 2% to 12%. Along the river edges, shifting, accretionary sand bars border most of the perimeter.

STUDY AREA AGRICULTURE

The soils of the river terraces are generally classified as Orthic Regosols developed on sandy parent material with remnant cobbles and boulders in the larger channels. The surface horizons are low in organic matter. The soils are moderately well to rapidly drained except for the deeper channels and lower levels of the terraces which may be subject to inundation.

The soils of the glaciofluvial terrace are developed on a sandy fluvial blanket overlying a very gravelly glaciofluvial deposit. The surface horizons are low in organic matter and the soils are rapidly drained.

Land Capability for Agriculture

The soils with the highest capability for agriculture in this sub-area are the level river terraces which have an irrigated rating of Class 2 with a combination of limitations due to low moisture holding capacity, low fertility, and topographic and textural variability. These soils are capable of producing a wide range of vegetable crops such as carrots, beets, onions, and potatoes as well as a variety of tree fruits, cereals, and forages.

The highest agricultural capability rating of the glaciofluvial terrace is Class 3. These soils are more limited in terms of moisture than the soils of the lower terraces because their elevated position prevents them from benefitting from natural subsurface irrigation. The range of crops these soils are capable of producing is narrower than for the Class 2 soils. Suitable crops include rutabagas and potatoes as well as tree fruits, small fruits, cereals and forages.

Channelling in the lower terraces has resulted in topographic limitations and these soils have been rated as Class 4. They are capable of producing cereals and forages as well as tree fruits. The portions rated Class 5 are capable of producing forage crops only.

The Class 6 soils with topographic and/or stoniness limitations are not considered arable but may be important as grassland or forested range, or as cleared pasture. The steep slopes surrounding the glaciofluvial terrace and separating the smaller terraces are rated as Class 7 with topographic limitations. These soils have no capability for arable culture or permanent pasture.

Present and Historical Use

Historically most of this area was orchard land associated with the Doukhobor villages at Brilliant and Ootischenia. A large portion of the area remains planted with fruit trees, some of which are maintained for the present owners' use and others which have become dormant and which yield no fruit. None of the remaining fruit production is commercially oriented or sold on a scale sufficient to provide a secondary income for area residents.

Land in this area has seen a considerable increase in residential use over former times and is now considerably fractionated. Other land areas are in use for a sawmill, a drive-in theatre, and Selkirk College.

Within the ALR, large areas of land remain undeveloped and can currently be classed as decadent orchard, cleared grassland, or are otherwise unused for agriculture. Many of these areas

offer good potential for the expansion of cultivation in the future, especially where easy access exists to irrigation water available from the two rivers.

The only crop production associated with commercial holdings takes place on Crown lands along both sides of the Kootenay River near its confluence with the Columbia. Grass hay has been cut on some of these lands for the last four or five years by the same rancher who grazes cattle on the Canadian Cellulose property in sub-area 3. Under the provisions of a flooding reserve placed on Crown lands below EL 1,425 feet (434 metres)[1] in favour of hydroelectric development, agricultural development of these lands has been limited to harvesting the existing stand of hay. Under the provisions of the flooding reserve, the Ministry of Lands, Parks and Housing will not accept any application for long-term agricultural use of the property. In the absence of this restrictive status, agriculture use would likely be much more intensive than occurs at present, as these lands have high capability and are well suited and situated for intensive, commercial agricultural use.

Outside the ALR, some cropping of native grass hay has also been carried out in recent years on the island situated immediately west of the college by the same operator who cuts hay off of nearby ALR Crown lands. The operator fords his machinery across the channel during low water. The area that is cropped is about 6 ha in extent.

While some minor livestock grazing activity may occur on the hobby farm areas in this sub-area, no grazing was observed or documented during these studies in any part of this sub-area.

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[1]Order-In-Council No. 403; February 27, 1954.

Sub-Area Synopsis

Agriculture in this sub-area is confined to a small amount of hobby farming as well as some haying of volunteer grasses on sub-irrigated Crown lands, both within and outside the ALR. The ALR comprises approximately 172 ha in this area, over two-thirds of which is arable. Present use consists of 20 ha of forage production and 12 ha of hobby farms and rural residential areas, with the remaining area not in agricultural use. Considerable areas of privately owned, vacant decadent orchard area and other cleared areas occur within the ALR in this sub-area. The remaining area is largely under forest/shrub cover and is not used for agriculture.

Table 3.2 summarizes the agricultural capability and present use of ALR lands found in this sub-area. Map 2 of the Cultural Resources series in the Resource Atlas shows these ALR areas, as well as areas of present agricultural activity outside the ALR.

SUB-AREA 5: CASTLEGAR - KINNAIRD

Terrain and Soils

This sub-area is dominated by bedrock at higher elevations (above 450 metres) and by glaciofluvial deposits supporting urban development (Castlegar and Kinnaird) at lower elevations. A glaciofluvial terrace with an elevation of approximately 550 metres located near the northern end of the sub-area is in the ALR. This unit consists of a gravelly, sandy, glaciofluvial terrace which overlies bedrock.

Table 3.2

SUB-AREA 4: KOOTENAY RIVER

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	45	26	4
3	8	5	< 1
4	52	30	5
5	12	7	1
6	18	10	2
7	25	15	2
UNCLASSIFIED	12	7	1
TOTAL	172	100	15

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	20	12	2
DECADENT ORCHARD	27	16	2
CLEARED LAND/ GRASSLAND	35	20	3
HOBBY FARM/ RURAL RESIDENTIAL	12	7	1
BUILT UP	16	9	1
OTHER	62	36	6
TOTAL	172	100	15

Small, cleared, level terraces are scattered throughout the sub-area and range in texture from sands to gravels.

Small areas on the western boundary of Castlegar, presently supporting small farm/hobby farm units are located on recent river terraces composed of sand overlying gravels.

Land Capability for Agriculture

The glaciofluvial terrace which occurs in the northern portion of the sub-area at about EL 550 m is rated Class 4 (irrigated) with limitations due to a low moisture holding capacity and stoniness. The units lying in the confines of Castlegar are channelled and are rated Class 4 with limitations due to low moisture holding capacity, stoniness and topography. Class 4 soils in this area should be capable of producing cereals such as barley and oats as well as most forage crops including hay.

Present and Historical Use

Below EL 500 m, this sub-area is almost entirely occupied by the built-up portions of the cities of Castlegar and Kinnaird. None of this area is in the ALR.

Agricultural activity is observed in a few parcels on the western edge of the area, which appears to be associated with small holdings where horses and cattle are kept for the owners' use. For example, there are approximately six hectares of land used for irrigated pasture and hay production adjacent to the railway yards in Castlegar at the upper boundary of the study area. This land is split into three or more separate units and production does not appear to be commercially oriented. The

operators of these units were not contacted during the field investigations. This area is shown on Map 2 of the Cultural Resources series of the Resource Atlas.

One or two smaller areas of pasture or hay production may be found on the slope adjoining Kinnaird. These are limited in extent and occur in areas under pressure for residential and industrial use. No expansion of agricultural activity on these rural residence/hobby farm areas is expected.

Above EL 500 m, which defines the study area, a commercial beef cattle and forage operation is located on the uplands adjoining sub-area 2. While this area does not have good road access, it is suited to cattle grazing use and limited forage production which could possibly be expanded, especially for summer grazing. The operator of this property was not contacted during the field investigations. The property is well outside the study area, and it is very unlikely that any cattle from this operation are pastured anywhere in the study area other than grazing areas documented in this report.

Beyond livestock use of a few small private pasture areas, such as the pasture areas near the railway yards, no grazing use was documented or is anticipated in this sub-area.

SUB-AREA 6: CASTLEGAR AIRPORT

Terrain and Soils

This sub-area consists of three major terrain units: an extensive set of glaciofluvial sub-terraces which lie on both sides of the airport complex and south to the sanitary landfill site, at about 470 m; a lower set of glaciofluvial terraces west of

the airport terraces at 435 m; and a set of terraces south of the lower terraces, at various elevations, which are dominantly uncleared. In addition, an upper glaciofluvial terrace lies east of the Castlegar Airport complex, part of which is presently used as a golf course. It lies within the ALR at an elevation above 500 m.

The glaciofluvial unit upon which the golf course is located is gently to strongly rolling with slopes ranging from 2 to 35%. This unit is separated from the lower terraces by steep slopes. Deposits of bedded sands and gravels, as well as lacustrine materials and bedrock underlie this unit.

The airport glaciofluvial terrace is level and consists of sub-terraces which are separated by relatively steep, short slopes.

Roughly 35 metres of steeply sloping topography separates the upper airport terraces and the lower terraces to the west which lie at about EL 435 m. The separating slope is periodically broken by small terraces at mid-elevations which are generally moderately to strongly sloping. Part of the lower terraces exhibit channeling characteristics while other areas are more typically level. Erosion of the edges of the upper terraces has resulted in the periodic occurrence of small alluvial fans on the lower terraces. The lower terraces slope steeply to the Columbia River except towards the southern portion of the unit which has been eroded down to the edge of the Columbia River. Shifting sand bars border the eroded unit.

The terrain unit to the south is separated from the lower terraces by bedrock which outcrops into the Columbia River. This unit is generally uncleared and consists of several level to gently sloping terraces separated by complex slopes. This

unit includes a large terrace at EL 548 m which is relatively level and partially cleared.

A landfill site is located on a glaciofluvial terrace south of the airport terraces which is dominantly level and which is separated from the other terrain units in this sub-area by steep slopes and bedrock.

The soils in this sub-area are developed on parent materials ranging in texture from deep sands to gravelly sands with a sand capping. Boulders and cobbles are frequently found in the alluvial fans, in deeper channels, and along road cuts in the more gravelly materials. The surface horizons are generally low in organic matter but may be as deep as 25 cm when developed on sandy soils which have been vegetated in grasses for long periods of time.

Land Capability for Agriculture

The soils with the highest agricultural capability rating in this sub-area occur on the level glaciofluvial terraces consisting of deep sands. These soils are rated as Class 2 (irrigated) with a limitation due to low moisture holding capacity. They are capable of producing a wide range of crops such as peas, lettuce, carrots and beets as well as a wide variety of tree fruits, small fruits, cereals and forages.

The agricultural capability rating of the soils in the remainder of the sub-area ranges from Class 3 to Class 7 depending on the combination and degree of limitations due to stoniness, topography and moisture. All of the soils have a moisture limitation resulting from the low water holding capacity characteristic of the coarse textured glaciofluvial materials.

The soils rated as Class 3 are capable of producing cabbage, rutabagas, potatoes, tree fruits, small fruits, cereals, and forages.

The soils rated Class 4 are capable of producing tree fruits, cereals and forage crops. Those rated Class 5 are only capable of producing forage crops such as hay.

The Class 6 soils in the sub-area are capable of producing forage for grassland and forested range as well as for pasture.

The steep slopes separating the terraces have an agricultural capability rating of Class 7. These soils have no capability for arable culture.

Present and Historical Use

This area encompasses the former Doukhobor village of Ootischenia, and is the largest area of historical and potential cultivation in the study area. The benchlands of the area were largely covered with irrigated orchards through the first part of the century, until the collapse of the Doukhobor commune in the 1930's. Since that time, little agricultural activity has occurred on these formerly cultivated areas and considerable areas of abandoned, decadent fruit trees are still evident.

The development of the area since 1940 has resulted in a considerable amount of residential use, along with the establishment of the airport, a golf course, and good road access. Much of the area has been subdivided into lots varying in size from 0.5 to about 8 hectares, which under the provisions of the

Agricultural Land Commission Act can be developed for residential use provided that, in parcels larger than 0.81 ha, no further subdivision occurs and no more than one residence is constructed per parcel.

The Regional District of Central Kootenay has proposed that the future settlement of this area be given further study to determine how its rural character can best be preserved. Two problems they foresee are encouraging agricultural uses of smaller holdings, and developing adequate irrigation water for larger scale production. The area's domestic and irrigation water supply is inadequate to support any significant expansion of residential or agricultural uses and studies are being carried out to secure an additional water supply. Once these issues are resolved, it is expected that this area will be developed at a much faster rate.

At present, there are no commercial farm operations in this study sub-area, although there is one farm which produces beef cattle and forage on a part-time basis located immediately outside the study area (above EL 500 m). It appears this ranch has an adequate land base to expand into a viable full-time operation, but that current production levels are relatively low. In 1979, livestock sales consisted of 3 cows.

Other areas of these benchlands, particularly above the EL 500 m, support small areas of pasture and hay production generally less than 4 ha in area, where forage is produced for small numbers of horses and cattle. The expansion of any of these enterprises to a commercial scale would require acquisition of an adequate land base.

Given that the area is already largely subdivided and that it may be difficult to acquire large areas for extensive agricul-

tural uses such as hay and cattle production, the area's best agricultural potential seems to lie in intensive orchard and market garden use, if irrigation sources can be developed. However, the present trend in this sub-area is towards increased hobby farm and rural residential use of the land, rather than towards such intensive horticultural uses.

There are two small parcels of Crown land leased for grazing use in this area. One is associated with the commercial cattle ranch, and the other with a stable and guest ranch facility. The guest ranch leases both private and Crown land for a herd of saddle horses (25 to 35 horses), but is not involved in commercial crop or livestock production. Both Crown grazing areas, as well as the private pasture leased by the guest ranch, are located on the higher terraces in and above this sub-area. Other than minor livestock use within some of the rural residential/hobby farm areas, no other grazing use was observed or documented in this sub-area.

Sub-Area Synopsis

This sub-area has a history of large scale orchard production and appears to offer the greatest land area for potential expansion of agricultural production in the study area. Most of this land is not used at present for commercial production, and any expansion would be dependent on development of an adequate irrigation source, and on competition with prospective residential land users once increased domestic water is made available. The ALR comprises 454 ha in this sub-area, almost 40% of all agricultural land reserve areas found in the study area. Most of this area is arable, with 40% consisting of high capability Class 2 and 3 lands. None of the area is devoted to commercial crop production. About 40 ha are in hobby farm or

rural residential use. While some of the remaining area is grazed by cattle, no other intensive agricultural activity takes place.

Table 3.3 summarizes the agricultural capability and present use of ALR lands found in this sub-area. These areas are portrayed on Maps 2 and 3 of the Cultural Resources series in the Resource Atlas. No areas of present agricultural use outside the ALR were found in this sub-area.

SUB-AREA 7: CHAMPION AND JORDAN CREEKS

Terrain and Soils

This sub-area consists of three major terrain units: a glaciofluvial terrace south of Champion Creek, a major glaciofluvial terrace north of Champion Creek which, for the purposes of this report, is called Champion Creek terrace, and a third terrace north of the Champion Creek terrace separated from it by an abandoned river channel.

The Champion Creek terrace is the most prominent unit in this sub-area. Decadent orchards are scattered across the terrace and the remaining lands are grass covered. On its western border, step-like sub-terraces below EL 436 m gradually grade towards the Columbia River. Shifting sand bars, which may be bouldery, skirt the terrace. Above EL 436 m, the terrace is relatively level except for a small area which has been highly channeled, resulting in steep slopes of approximately 30%. An alluvial fan, formed by Champion Creek as it emerges from bedrock lying east of the terrace, is complexed with it but has little effect on the main portion of the terrace. On its southern boundary the terrace slopes steeply to Champion Creek.

Table 3.3

SUB-AREA 6: CASTLEGAR AIRPORT

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	122	27	11
3	57	13	5
4	127	28	11
5	6	1	< 1
6	25	6	2
7	91	19	8
UNCLASSIFIED	26	6	2
TOTAL	454	100	39

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	128	28	10
CLEARED LAND/ GRASSLAND	62	14	5
HOBBY FARM/ RURAL RESIDENTIAL	40	9	4
BUILT UP	29	6	3
OTHER	195	43	17
TOTAL	454	100	39

STUDY AREA AGRICULTURE

The unit north of the Champion Creek terrace is a relatively level glaciofluvial terrace which is bounded by steep slopes on its western and eastern borders. To the east, the steep slopes bound an upper terrace consisting of glaciofluvial materials which overlies bedrock and is complexed with colluvium. To the west the terrace slopes steeply to a narrow, level recent river terrace which lies along the Columbia River and which provides access to the Champion Creek terrace. Shifting sand bars lie at the base of the narrow terrace.

The unit south of Champion Creek is a relatively level glaciofluvial terrace which has been incised by Jordan Creek and an abandoned river channel. This terrace slopes steeply to the Columbia River on its western border and to Champion Creek on its northern edge.

The soils occurring on the recent river terraces, which are generally below EL 427 m, are Orthic Regosols developed on sandy parent material. These soils have a thin organic surface horizon and are rapidly drained. The soils which occupy the remainder of the Champion Creek terrace as well as the terraces to the north and south are developed on gravelly sandy parent material which has a sandy capping. The gravelly material contains cobble sized fragments which are exposed on the southern escarpment of the Champion Creek terrace. The surface horizons of these soils are low in organic matter and are roughly eight to 10 cm deep. These soils are rapidly drained.

A small tributary of Champion Creek cuts across the Champion Creek terrace. The soils in this incised area as well as in the river channels cutting the southern terrace are developed on bouldery, sandy parent material. Boulders also occur in the alluvial fan area of the Champion Creek terrace.

STUDY AREA AGRICULTURE

Land Capability for Agriculture

The soils with the highest agricultural capability rating are those which have developed on the level, recent river terraces. These soils are rated Class 2 (irrigated) with limitations due to low moisture holding capacity. They are capable of producing a wide range of crops which includes most types of vegetables, tree fruits, small fruits, cereals, and forage crops.

The soils which occupy most of the higher terraces throughout the sub-area have an agricultural capability rating of Class 3 with limitations due to low moisture holding capacity and stoniness. In the channeled areas of the lower river terraces the soils are rated Class 4 with limitations due to topography as well as low moisture retention properties. Most of the slopes separating the sub-terraces are gently sloping and have an agricultural capability rating of Class 3 with limitations due to topography and low moisture retention. These soils are more limited than the Class 2 soils in the range of crops they are capable of producing. Suitable crops for the Class 3 soils include brussels sprouts, cabbage, rutabagas and potatoes as well as tree fruits, and small fruits such as raspberries and strawberries, and most cereals and forage crops. The soils rated as Class 4 in this area are capable of producing cereals such as barley, oats, tree fruits, and most forage crops including hay. The remainder of the study area consists of soils ranging from Class 5 to Class 7 depending on the extent and number of limitations due to topography and stoniness in conjunction with poor moisture retention properties. Those soils rated as Class 5 are capable of producing tree fruits and most forage crops. Those rated as Class 6 are capable of producing forage for grassland and forested range, and cleared pasture. Those soils rated as Class 7 are not capable of arable culture.

STUDY AREA AGRICULTURE

Present and Historical Use

The Champion and Jordan Creeks sub-area represents a large area of arable land where historical cultivation has long been abandoned, but serves as a still visible reminder of the lands' potential. This area was associated with the Ootischenia Doukhobor settlement.

The land adjacent to Champion Creek was once cleared and is now either in grassland or supporting decadent fruit trees. There is no residential use or development of this land, and cattle are left to graze for the summer months. Most of the property is owned by an absentee landlord with no apparent interest in agricultural development. The land is presently leased to an area rancher for grazing use part of the year. While the property only provided about 160 Animal Unit Months (AUMs) of grazing in 1980, usage as high as 1,200 AUMs over the period May to November was reported for other years. The rancher involved rents grazing at the Champion Creek property, cuts hay off of a B.C. Hydro property for an annual fee, and overwinters his breeding herd, presently numbering 25, at a third property. The livestock produced are ususally sold at the Kamloops sales yard.

The land in the ALR adjacent to Jordan Creek does not appear to have been cultivated, and is under forest cover. There is no established access to this land. No grazing use is made of this area.

The potential for the Champion Creek terrace area to be returned to production depends partially on the provision of adequate irrigation. It is likely the area could be irrigated from the Columbia River or Champion Creek. The relative isolation and restricted access of these properties, though posing a

minor inconvenience to agriculture, reduces the potential for conflicts and competition between future agricultural use and residential or other uses of the land and should permit, for example, the continuation of unconfined cattle grazing.

Sub-Area Synopsis

The Champion and Jordan Creeks sub-area presents itself as an historical orchard area that could be returned to the production of a variety of crops. The ALR lands are approximately 202 ha in extent, of which over 60% is arable. The land is predominantly rated Class 3.

About 60% of the area has been cleared including almost 32 ha of decadent orchard. There is adequate road access to most of the area at present, and irrigation water is likely available from both Champion Creek and from the Columbia River. Table 3.4 presents in detail the present use and land capability for agriculture classification of lands in sub-area 7. These areas are depicted on Map 4 of the Cultural Resources series in the Resource Atlas. No areas of present agricultural activity were found outside the ALR in this sub-area.

SUB-AREA 8: BLUEBERRY CREEK - GENELLE

Terrain and Soils

There are three units in this sub-area within the ALR. These units are considered to be part of the system of glaciofluvial terraces which line the Columbia River. Two of the units are located at an elevation of about 518 m and the terrace south of Blueberry Creek lies at approximately 450 m. Unlike most of

Table 3.4

SUB-AREA 7: CHAMPION AND JORDAN CREEKS

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	6	3	< 1
3	105	53	9
4	14	7	1
5	6	3	< 1
6	13	6	1
7	58	28	5
UNCLASSIFIED	-	-	-
TOTAL	202	100	16

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	32	16	3
CLEARED LAND/ GRASSLAND	86	42	7
HOBBY FARM/ RURAL RESIDENTIAL	-	-	-
BUILT UP	-	-	-
OTHER	84	42	6
TOTAL	202	100	16

the study area, there are few substantial terraces below 450 m. The river terrace presently occupied by part of the town of Genelle is an exception.

The terrace directly south of Blueberry Creek has the least amount of variation in its topographic expression. This unit consists of deep sands in the southern portion which gradually grade to a gravelly, cobbly material towards the northern edge of the unit. A deep gully which separates Blueberry Creek town from the terrace exposes the gravelly, cobbly glaciofluvial materials which comprise the northern portion of the terrace. The terrace is dominantly level but slopes gently towards the north.

The topography of the terrace located opposite the Champion Creek terrace varies over short distances ranging from level to steeply sloping. Texture of materials ranges from deep sands with no coarse fragments to cobbly, gravelly sands. The terrace is bounded by very steep, long slopes on its southern and eastern boundaries and on the west by bedrock.

The terrain of the unit which overlooks Genelle has been eroded to a relatively narrow terrace bounded by very steep slopes. Escarpments adjacent to the China Creek settlement expose deep sands which comprise at least part of this terrace. The upper surface of the terrace consists of small sub-units which differ in topographic expression.

The soils in this sub-area are developed on a range of parent materials varying from deep sands with no coarse fragments to gravelly, cobbly sands. In the few areas which have been cleared and are under grassland vegetation, soils with a sandy parent material were found to tend towards Chernozemic development. All of the soils in this sub-area are rapidly drained

due to their elevated position in conjunction with the coarse nature of the parent materials.

Land Capability for Agriculture

The soils developed on the level portions of the terraces which are dominantly sandy in texture have the highest agricultural capability rating. These areas are rated Class 2 (irrigated) with limitations due to low moisture holding capacity. These soils include a large part of the terrace directly south of Blueberry Creek and are capable of producing a wide range of crops including most vegetables, such as tomatoes, lettuce, broccoli, and carrots, as well as most tree fruits, small fruits, cereals, and forages. The remaining part of this terrace is rated Class 3 with limitations due to stoniness and low moisture retention capacity. These soils are capable of producing a narrower range of crops than the Class 2 soils.

The soils in the other two units range between Classes 3 and 7 with limitations due mostly to topography, as these terraces are eroded and bounded by steep slopes. Stoniness is also a limitation for many of the soils. The Class 4 soils are fairly limited in the range of crops they are capable of producing which includes some tree fruits, cereals such as barley and oats, and most forage crops. Those soils rated Class 5 are more suited to forage crops such as hay. The Class 6 soils are best suited as range for grazing. The Class 7 soils are not considered capable of arable culture.

STUDY AREA AGRICULTURE

Present and Historical Use

There is no commercial or hobby farm cultivation currently carried out in this sub-area, and unlike nearby lands in the study area, there is no evidence of historical cultivation either.

The lands which are included in the ALR exhibit varying capability for agriculture and most are potentially cultivable. ALR lands are found in three separate units, each of which has good access but is undeveloped and under forest cover. Two of these areas extend above EL 500 m. ALR lands occupy about 59 ha.

The development of ALR land in this sub-area for cultivation may conflict with forestry or wildlife uses, and would be contingent upon the availability of adequate irrigation water. Two tributary creeks of the Columbia River, Blueberry Creek and China Creek, flow through this sub-area and are not yet fully recorded for irrigation use. If necessary, irrigation water could be pumped up from the Columbia River, though this development would prove much more costly than utilizing tributary flows in gravity systems.

The residential areas of Blueberry Creek and Genelle do not adjoin any of the ALR lands, and there does not appear to be any residential use or pressure for use of these areas. There is no significant cultivation or hobby farm use of lands outside the ALR in this sub-area.

STUDY AREA AGRICULTURE

Sub-Area Synopsis

The ALR in the Blueberry Creek-Genelle sub-area encompasses three blocks of capable lands which have not previously been developed for agricultural use, and which total about 59 ha. These areas have good access but any future attempt to cultivate them may encounter an inadequate irrigation supply or conflict with forestry or wildlife uses.

Over 60% of the ALR land is arable and almost all of it is undeveloped and under forest cover (97%). Table 3.5 presents a breakdown of present use and the land capability for agriculture in these ALR areas. The areas are shown on Map 4 of the Cultural Resources series of the Resource Atlas. No grazing or other agricultural use outside of the ALR in the sub-area was observed or documented.

SUB-AREA 9: BILLY CREEK

Terrain and Soils

The soils in this sub-area were not field checked due to difficult access. Air photo interpretation indicates that this sub-area is dominated by bedrock and colluvial aprons with two isolated units outside the ALR consisting of recent river terraces at about EL 427 m. A terrace within the ALR which occurs above 457 m is a glaciofluvial deposit.

Land Capability for Agriculture

The unit within the ALR has been rated from Class 4 to Class 7 with differing degrees of limitations due to stoniness, low

Table 3.5

SUB-AREA 8: BLUEBERRY CREEK - GENELLE

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	15	25	1
3	18	31	2
4	4	7	< 1
5	4	6	< 1
6	2	4	< 1
7	16	27	2
UNCLASSIFIED	-	-	-
TOTAL	59	100	5

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	-	-	-
CLEARED LAND/ GRASSLAND	2	3	< 1
HOBBY FARM/ RURAL RESIDENTIAL	-	-	-
BUILT UP	-	-	-
OTHER	57	97	5
TOTAL	59	100	5

soil moisture holding capacity, topography and bedrock, with the steep escarpments rated as Class 7. The soils lying on the more level portion of this terrace are rated as Class 4 with limitations due to stoniness and low moisture holding capacity. These soils should be capable of producing a narrow range of crops which includes oats and barley and forages, such as hay.

Those rated Class 6 are best suited for grazing purposes and those rated Class 7, including very steeply sloping lands and bedrock, are not considered suitable for agricultural use.

The two fluvial terraces outside the ALR were not field checked due to lack of access. However, it is assumed that they have agricultural capability.

Present and Historical Use

The Billy Creek sub-area is not currently in agricultural use and has not previously been used for agriculture. Although there are lands in the ALR on the east bank of the Columbia River, their total area is limited (35 ha) and access is poor. The ALR lands are found in one contiguous block that is under forest cover and undeveloped for agriculture. Irrigation water would be available from either Billy Creek or the Columbia River if the lands were developed.

The two fluvial terraces found outside the ALR are both under forest cover and are undeveloped for agriculture. There is no access to these small areas, and there is no other arable land in the vicinity.

No grazing of livestock occurs in this sub-area which is, for the most part, unsuitable as rangeland.

Sub-Area Synopsis

Table 3.6 presents in detail the land capability classification for agriculture for the ALR land in this sub-area. This area is shown on Maps 5 and 6 of the Cultural Resources series in the Resource Atlas. No areas of agricultural or grazing use were identified outside of the ALR.

SUB-AREA 10: OASIS

Terrain and Soils

This sub-area is dominated by bedrock at the surface but three non-bedrock areas are in the agricultural land reserve. Two of the units lie above EL 518 m and were not field checked due to inadequate access. Terrain maps for these units were not available. Topographic maps and air photo interpretation indicate that long steep slopes separate these units from Highway 3.

The unit south of the golf course is bounded by bedrock on its western edge. Other than the western border, the unit is surrounded by steep slopes cut by Murphy Creek on the north and McNally Creek to the south. The unit is dominantly level.

Topographic maps indicate that the unit in the southernmost portion of the sub-area is also dominantly level. Hanna Creek has cut steep slopes at the southern boundary of this unit.

The third unit within the ALR consists of a higher elevation glaciofluvial terrace (at about EL 436 m) part of which is occupied by a golf course, and a lower recent river terrace

Table 3.6

SUB-AREA 9: BILLY CREEK

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	-	-	-
3	-	-	-
4	22	63	2
5	-	-	-
6	1	3	< 1
7	12	34	1
UNCLASSIFIED	-	-	-
TOTAL	35	100	3

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	-	-	-
CLEARED LAND/ GRASSLAND	-	-	-
HOBBY FARM/ RURAL RESIDENTIAL	-	-	-
BUILT UP	-	-	-
OTHER	35	100	3
TOTAL	35	100	3

(below EL 427 m) in an area known as Birchbank. Generally, steep slopes separate these upper and lower terraces. Sullivan Creek cuts across the northern end of the terrace as it flows towards the Columbia River. Shifting sand bars occur along the bank of the Columbia at the base of this unit. On the upper terrace a small outcropping of bedrock occurs but it does not interfere with the agricultural capability of the terraces as it lies adjacent to the highway. The soils in the upper terrace range from sands overlying gravelly sandy materials to gravelly sandy textures at the surface. The terraces are dominantly level and the soils are rapidly drained.

The soils lying in the Birchbank region are developed on sands with no coarse fragments. These soils are moderately well drained and at this lower elevation may benefit from natural, sub-surface irrigation. A cleared portion of this terrace has been developed as a picnic site.

Land Capability for Agriculture

The soils with the highest agricultural capability rating are those which occur on the level sandy portions of the upper and lower terraces generally in the golf course and Birchbank unit. These soils are rated as Class 2 (irrigated) with limitations due to a low moisture holding capacity. Those which occur on the gravelly, sandy, level portions of the terrace are rated as Class 3 with limitations due to insufficient moisture retention and stoniness. The gentler slopes which separate the upper and lower terraces of the golf course unit have an agricultural capability rating of Class 5 with limitations due to low moisture holding capacity, stoniness and topography. The steep slopes which separate the terraces are rated as Class 7 with limitations due to topography. The unit

at the southernmost portion of the sub-area has been rated as Class 4 with limitations due to stoniness and insufficient moisture retention capacity.

The remaining unit, based on air photo interpretation and BCLI mapping, ranged from Class 3 to Class 7.

The soils rated as Class 2 are capable of producing a wide range of crops which includes many vegetables such as cucumbers, corn, cauliflower and brussels sprouts as well as many tree fruits, small fruits, cereals and forages. Those soils rated as Class 3 are more limited than the Class 2 soils in the range of crops they are capable of producing. Crops which they should be capable of producing include brussels sprouts, cabbage, rutabagas, and potatoes, tree fruits, some small fruits such as raspberries and strawberries, cereals such as barley and oats as well as forage crops.

The Class 4 soils are capable of producing some cereal crops such as barley and oats and forage crops. The Class 5 soils are most suited to forage crops such as hay. Those rated Class 6 are most suited to grazing. The Class 7 soils are not considered capable of arable culture.

Present and Historical Use

Agricultural land reserves in this sub-area occupy large land areas both above and below the 500 m elevation. None of the areas is commercially farmed, and the only agricultural activity consists of 4 ha of forage production in conjunction with a hobby farm.

STUDY AREA AGRICULTURE

Historically, the land occupied by the golf course at Birchbank was farmed. When the golf course was established, a small area of land remained which is leased for hobby farm use. Other areas in the ALR exhibit capability for agriculture and are potentially cultivable. Other than on the leased property (about 5 ha) no grazing of livestock is carried out in this sub-area. The operator of the hobby farm area keeps a few cattle for his own use only.

Murphy Creek is fully recorded for irrigation use but an irrigation licence may be available on Sullivan Creek. Alternatively, water could be drawn from the Columbia River to irrigate some of these areas.

Above EL 500 m, all ALR areas are under forest cover and are undeveloped.

Sub-Area Synopsis

The ALR in this sub-area occupies about 180 ha, about 70% of which is arable. A golf course and other built up areas account for about 40% of the total area, hobby farm use occupies about 2%, and nearly 60% of the area is undeveloped.

Table 3.7 presents a detailed breakdown of agricultural land capability and use in the Oasis sub-area. Land use and capability in the ALR in this sub-area is depicted on Map 5 of the Cultural Resources series of the Resource Atlas. There is no agricultural activity outside the ALR in this sub-area.

Table 3.7

SUB-AREA 10: OASIS

Agricultural Capability of Sub-Area Lands within the Agricultural Land Reserve

CAPABILITY CLASS	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
1	-	-	-
2	78	44	7
3	28	16	3
4	2	3	< 1
5	10	6	< 1
6	18	10	2
7	27	14	2
UNCLASSIFIED	15	7	1
TOTAL	178	100	15

Present Land Use of Sub-Area Lands within the Agricultural Land Reserve

PRESENT LAND USE	AREA (ha)	% SUB-AREA	% STUDY AREA IN ALR (1132 ha)
HORTICULTURE	-	-	-
FORAGE	-	-	-
DECADENT ORCHARD	-	-	-
CLEARED LAND/ GRASSLAND	-	-	-
HOBBY FARM/ RURAL RESIDENTIAL	4	2	< 1
BUILT UP	69	39	6
OTHER	105	59	9
TOTAL	178	100	15

STUDY AREA AGRICULTURE

STUDY AREA SUMMARY

According to the detailed inventory of the agricultural resources and their present utilization carried out in this study, it is estimated that the study area contains about 1132 ha within the ALR. Two thirds of this land is classified as arable (within capability classes 1-5) and almost half of this area can be termed prime agricultural land (capability classes 1-3) capable of supporting a wide range of alternate cropping enterprises.

Although as much as half of this ALR area may have been cultivated at one time or another since the turn of the century, present commercially oriented cultivation occurs on only about 20 ha, less than 2% of the ALR area. Much of the rest of the formerly cultivated area has been abandoned or has been converted to hobby farms, rural residential use, built-up areas, or has otherwise been developed or retained for urban related uses.

The remaining half of the ALR lands has not been developed and remains largely covered by shrubs and mixed wood forests.

These estimates are based on digitized results using the 1:10,000 and 1:50,000 Agricultural Land Reserve Plans of the Central Kootenay and the Kootenay-Boundary Regional Districts. ALR boundaries were transposed to the 1:10,000 orthophoto maps prepared for the Properties Division of B.C. Hydro, and areal estimates taken by planimeter. This methodology is expected to be reasonably accurate, nevertheless some error in this estimate is anticipated.

Only three operations involving commercial livestock enterprises were documented within the study area. These

included grazing of cattle on about 10 ha of vacant private land on the Pass Creek fan by a part-time operator from outside the study area, the use of small areas of Crown and private land to pasture horses used in a guest ranch located within the study area, and the use, by a part-time area rancher, of privately owned vacant lands on the Champion Creek fan for cattle grazing. Two other cattle operations were noted immediately outside the study area (above EL 500 m) but these operations did not appear to use study area lands for grazing.

In addition, livestock are found on many of the numerous hobby farms and rural residences found in the study area. Although these properties were not surveyed in detail, it appears that any livestock use was confined within the properties.

Table 3.8 provides a summary of the capability and present use of lands found within the study area's agricultural land reserves. These areas, together with all areas of present agricultural use outside the ALR, are depicted on the Cultural Resources mapping series contained in the Resource Atlas.

Table 3.8

SUMMARY OF STUDY AREA AGRICULTURE

Agricultural Capability of Study Area Lands within the Agricultural Land Reserve

AGRICULTURAL CAPABILITY CLASS	AREA (ha)	% TOTAL
1	-	-
2	280	25
3	216	19
4	228	20
5	38	3
6	77	7
7	237	20
UNCLASSIFIED	56	5
TOTAL	1132	100

Present Land Use of Study Area Lands within the Agricultural Land Reserve

LAND USE	AREA (ha)	% TOTAL
HORTICULTURE	-	-
FORAGE	20	2
DECADENT ORCHARD	187	16
CLEARED LAND/GRASSLAND	186	16
HOBBY FARM/ RURAL RESIDENTIAL	63	6
BUILT UP	114	10
OTHER	562	50
TOTAL	1132	100

CHAPTER 4

AGRICULTURAL IMPACT EVALUATION

PROJECT DEFINITION

This chapter presents a detailed assessment of potential impacts on present and potential agricultural production that would occur if the proposed Murphy Creek Hydroelectric Project is implemented. This assessment is based upon consideration of the proposed reservoir level, as well as two alternate reservoir levels that were initially considered. The possible reservoir levels considered are:

* 424 metres a.s.l. (proposed)
* 427 metres a.s.l.
* 430 metres a.s.l.

The preliminary damsite works considered are those described in the Murphy Creek Project Engineering Description prepared by B.C. Hydro in November, 1982 (B.C. Hydro, 1982a). Conceptual layouts of required highway, railway, and transmission line rights-of-way relocation associated with damsite construction were assessed as part of the damsite considerations, based on a B.C. Hydro drawing of November, 1982 (B.C. Hydro, 1982b). The proposed relocation of the CPR rail line in the Birchbank area

necessitated by the project was assessed as outlined in Murphy Creek Hydroelectric Development Impact on Existing CP Rail Facilities (Thurber, 1982). Proposed construction areas, including spoil areas associated with dam construction, were assessed based on a B.C. Hydro drawing of November, 1982 (B.C. Hydro, 1982c). All of these plans are preliminary and conceptual in nature and, as such, are subject to revision.

No detailed agricultural impact evaluation of the possible development of a till site near Murphy Creek in sub-area 10 was carried out as no agricultural resources were judged to be affected.

No other possible project works were considered in this impact evaluation, due to a lack of definition.

Based on an initial B.C. Hydro land acquisition policy statement for the Murphy Creek Project (B.C. Hydro, 1980), and subsequent conversations with Properties Division personnel, it has been assumed that any acquisition practices related to project implementation would not produce any agricultural impacts on lands not directly inundated or occupied by project works.

Finally, on the basis of a preliminary terrain analysis carried out by Thurber Consultants Ltd. (Thurber, 1980) and Pedology Consultants Ltd. (Pedology, 1979), and preliminary B.C. Hydro proposals for bank protection, berming and filling of low-lying areas (B.C. Hydro, 1982d,e,f), possible impacts associated with erosion, slumping, and filling were identified.

AGRICULTURAL IMPACT EVALUATION

METHODOLOGY AND LIMITATIONS

This impact assessment is based on the agricultural inventory of the study area presented in the previous chapter and is subject to the errors and limitations imposed on any such inventory gathering program.

In addition, this impact assessment uses estimates of possible agricultural land areas affected by the proposed project. These estimates were hand digitized using available 1:10,000 scale orthophoto maps with 3 m contour intervals. Both the digitizing procedure and the topographic information are subject to minor error. These estimates were later checked against 1:2500 and 1:1250 scale mapping and no changes were deemed to be warranted. Digitizing error is usually in the range of ± 5%, while topographic mapping is usually carried out to an accuracy of ± 1/2 contour interval.

The method of ascribing value to the agricultural lands potentially affected by the project that is used in this impact assessment is by projection of future economic rents foregone in the face of the project. While methodologically acceptable, this method yields results only as good as the economic and agronomic information needed to employ it. Much of the required information is not specifically available for the study area, necessitating extrapolation of data from other areas (and other time periods). The choice of what constitutes applicable data represents a professional opinion and may be subject to judgemental error.

Finally, the conversion of land capability mapping that is not site or crop specific to future site-specific crop production estimates, is often subject to considerable error, due to variability in edaphic and climatic parameters that cannot be

identified without detailed soils and agrometeorological assessment.

Despite these qualifications, the methodology chosen represented the best available within the dictates of budget, time, and the Terms of Reference.

The following sections discuss the potential impacts of the project on the present use and future potential of the study area's agricultural resources. These discussions primarily are concerned with arable lands presently contained within agricultural land reserve areas.

No significant agricultural impacts have been identified for lands outside the agricultural land reserve. Chapter 3 describes minor areas of agricultural use or agricultural capability that occur outside the ALR. These areas have been largely discounted from the following impact assessment for one or more of the following reasons:

* they will not be impacted by the project
* they contain no present agricultural use that will be impacted by the project
* they are presently in largely irreversible non-agricultural uses, or are likely to be developed for such non-agricultural uses

Only in two areas, have minor impacts on agriculture outside the ALR been identified. These are outlined in the appropriate sub-area impact assessments that follow.

AGRICULTURAL IMPACT EVALUATION

SUB-AREA 1:
COLUMBIA RIVER NORTH (HUGH KEENLEYSIDE DAM TO ROBSON)

This sub-area contains no ALR areas. Although small pockets of commercial tree fruit production still can be found in the Robson area, these areas are under considerable development pressure and are unlikely to remain as commercial operations in the long term. None of these areas is subject to possible inundation, and no irrigation intakes on the Columbia River are involved.

Near Balfour, berming and land filling is proposed in an area presently partially occupied by a hobby farm. Approximately 0.4 ha of the property would be filled. The area potentially affected contains a few fruit trees. Any impacts on this property cannot be defined without detailed information on the exact area to be filled, the source and quality of the fill materials, the manner in which filling is to be carried out and the reclamation procedures to be implemented. Even with land filling, it is possible that some of the fruit trees may be potentially impacted by the project through increased water table levels.

Much of the shoreline in this sub-area is proposed to have toe protection. In areas where no shoreline protection is proposed, no agricultural impacts are projected to occur due to possible bank erosion.

Area growers have expressed some concern over the potential effects of a larger reservoir surface on the area's microclimate and suitability for tree fruit production. Increased localized humidity during the growing season may promote spore germination associated with fungus diseases of fruit trees, such as apple scab. This might result in reduced fruit quality

or might necessitate increased expenditure on crop sprays to control these diseases. While such a possibility is noted, definition of this impact requires causality to be established not only between the increased pondage surface area and humidity in the Robson area, but also between increased humidity and incidence of apple scab and other such diseases. Based on information supplied by B.C. Hydro, it appears that increased humidity for adjacent agricultural lands is an unlikely consequence of the proposed reservoir or, at the worst, humidity increases will be minor compared to the wide natural variability in humidity, or the variation in humidity caused by irrigation of agricultural lands (B.C. Hydro, 1982).

SUB-AREA 2:
COLUMBIA RIVER SOUTH (HUGH KEENLEYSIDE DAM TO CASTLEGAR)

This sub-area contains no ALR areas. Outside the ALR, the one small hobby farm in this sub-area would possibly incur a minor loss of land to inundation for reservoir levels above EL 424. At the proposed level of EL 424, the only impacts that may occur would be a minor amount of bank erosion. No shoreline protection is proposed for this area.

SUB-AREA 3: PASS CREEK

This sub-area contains 13 ha of ALR land which would be inundated at the proposed reservoir level of EL 424 m. Of this potentially impacted land, 11 ha is arable. A further 9 ha of arable land would be flooded at pondage levels between 424 and 427 m. No additional ALR lands would be affected at the highest reservoir level initially considered. None of this area is presently used for commercial agriculture, although

about 7 ha are occupied by hobby farms and rural residences. Part of the area is in the Pass Creek Regional Park. Most of the area potentially inundated is rated as BCLI Class 2. In the absence of the project, it is not anticipated that these lands will enter commercial agricultural production.

No shoreline protection works are proposed for ALR lands or areas presently in agricultural use. However, no agricultural impacts due to bank erosion are projected.

Outside the ALR, the present agricultural use of lands owned by the school board and B.C. Timber Ltd. would not be affected at EL 424 m. At EL 427 or 430 m, all such use would be impacted. This use consists of about 2 ha of hay taken from the school board property by a local hobby farmer on a share-crop basis, and about 10 ha of grazing on the B.C. Timber Ltd. property. Because of the nature of these land holdings, this use cannot be projected to continue into the future for more than a limited period of time. In the absence of the project, institutional and industrial uses of these lands are far more likely than agricultural uses.

SUB-AREA 4: KOOTENAY RIVER

This sub-area contains the second largest and potentially most valuable area of agricultural land that is subject to possible flooding. A total of 20 ha of ALR land is potentially affected at the proposed reservoir level of EL 424. At EL 427 m alternate level initially considered, inundated ALR lands would total 63 ha, and at 430 m inundation would be confined to 75 ha of ALR lands. Almost all of these areas are arable with about half the area involved in each instance being high capability Class 2 land.

AGRICULTURAL IMPACT EVALUATION

The area subject to inundation at EL 424 m consists of 14 ha of commercial forage production, 1 ha of decadent orchard, 1 ha of grassland, and 4 ha of other land, principally old river channels, steep slopes, and areas covered with shrubs. Included in the ALR area potentially inundated at the higher pondage levels considered are 4 ha of built-up area (industrial) which would be inundated at EL 427 m, and 2 ha of rural residences, which would be inundated at EL 430 m, and would become surrounded by water at EL 427 m.

In addition, approximately 1.6 ha of depresional ALR lands on the Brilliant fan are proposed for filling (EL 424 m reservoir). These areas are all arable, consisting mostly of high capability vacant land presently supporting decadent fruit trees. Based on the 1:10 000 orthophoto mapping used to identify potentially inundated areas, these areas would not be subject to flooding at the proposed reservoir level of EL 424 m. Because of the coarse textured materials found on this fan, however, it is likely that, in the absence of land filling, these areas would either fill with water or would incur a very high water table. The nature of any agricultural impacts due to proposed land filling cannot be defined without detailed information on the proposed works. However, with suitable attention to reclamation planning, impacts could be limited to the period of soil disturbance and a brief following period during which a suitable ground cover is re-established.

No shoreline protection is proposed for riverbank areas associated with ALR lands in this sub-area. The only area where bank erosion due to increased water levels may impact arable lands is a 200 m stretch of a vacant, undeveloped low capability unit that fronts onto a steep high bank located south of the Selkirk College lands.

AGRICULTURAL IMPACT EVALUATION

At a reservoir level of EL 424 m, all of the arable lands that would be affected are presently held by the Crown. Agricultural use of these lands has been limited to harvesting the existing stand of hay because of the provisions of the flood reserve placed on Crown lands below EL 434 m in this area. In the absence of the project, it is very difficult to predict future use of this area, because it is uncertain that the flood reserve would then be removed.

If the area remains in the ALR and the flood reserve remains in place, even if the current Murphy Creek Project did not proceed it is likely that future use of these Crown lands would resemble the low intensity use found there at present. However, if the flood reserve was removed and the lands remained in the ALR, it is expected that the area would be offered as an agricultural lease to the highest bidder, and the area would be developed for an intensive agricultural use such as vegetable production. However, it is not apparent whether the flood reserve would be removed if a decision was taken not to proceed with the current project being considered.

The non-Crown areas potentially subject to inundation in this sub-area at the higher reservoir levels are substantially fractionated and largely committed to non-agricultural uses, and no reversion to commercial agriculture would be expected to occur in the future if the Murphy Creek Project did not proceed.

In addition to these ALR areas, the island area that has been used in recent years for the cutting of native grasses would be impacted at any of the reservoir levels considered. The high cost of accessing this island and providing flood protection for it, as well as its location within the flood reserve, will serve to limit its agricultural development in the future.

SUB-AREA 5: CASTLEGAR-KINNAIRD

This sub-area contains no ALR areas. Outside the ALR, the hobby farm area west of the main Castlegar urban area would not be impacted. No agricultural impacts are envisioned in this sub-area.

SUB-AREA 6: CASTLEGAR AIRPORT

A maximum of 8 ha of ALR land in this sub-area would be affected at the proposed reservoir level of EL 424 m, including only 2 ha of arable land. The area inundated would increase considerably at higher reservoir levels; 15 ha at EL 427 m, and 45 ha at EL 430 m. Generally, higher capability agricultural land (Classes 2-4) would not be affected unless the reservoir level exceeded 427 m. Arable areas affected at the higher pondage levels occur mostly in the Cai Creek area and are largely grassland or forested. No agricultural use occurs at present on these areas, although one small area of hobby farm/ rural residences would be affected at EL 430 m.

Shoreline protection is proposed only along portions of the arable lands situated above the Columbia River in Sub-area 6. Approximately 1700 m of high to moderate capability ALR lands and 500 m of low capability lands, located on high terraces above the river with steep slopes occurring between the proposed pondage and the arable lands, would be left without protection. Without protection, some of these lands may be lost due to bank erosion in this area. All of the higher capability lands occur between the Columbia River highway bridge and Cai Creek.

North of Cai Creek substantial fractionation exists in the ALR areas potentially affected. It is extremely unlikely that these areas would be used for agriculture in the future, in the absence of the project.

South of Cai Creek the ALR potentially affected occurs as part of a relatively limited low capability unit, which would be suited to forage production, as well as the production of tree fruits such as apples. Irrigation would be required, with the Columbia the only identifiable source. However, it is difficult to substantiate a case for this land moving into agricultural production in the absence of the project. The area is bisected by a transmission line right-of-way, and may have restricted availability for agricultural use due to the provisions of the flooding reserve placed on Crown lands below EL 434 m.

SUB-AREA 7: CHAMPION AND JORDAN CREEKS

In this sub-area, 9 ha of ALR land, including 5 ha of Class 3 lands are potentially affected at the proposed reservoir level. This amount would increase nearly proportionately at higher reservoir elevations initially considered. All of this land is either in decadent orchard or cleared grassland at present. Present agricultural activity is confined to cattle grazing. All of this arable land was farmed in the past, principally as fruit orchards, as part of the former Doukhobor settlement of the area.

This area represents a good prospect for future intensive agricultural activity, although development of the area may be restricted or retarded because most of the area is held by an

absentee landlord (under lease to an area rancher for grazing use part of the year) with no apparent interest in farming.

Future agricultural use, which could range from a forage-based cattle operation to vegetable or fruit production, would require irrigation. Gravity fed Champion Creek water or pumped Columbia River water are the only obvious sources. Historical cultivation used Champion Creek as an irrigation source.

An additional potential impact in this sub-area involves the possible flooding of the only access road to the Champion Creek terrace. A large portion of the existing road (a rough dirt track) would be inundated. Alternate alignments on higher ground may be difficult to develop.

Shoreline protection is proposed along the northern portions of the Champion Creek fan in the area where the existing farm access road is located. Other than for a small cemetery area located on the Champion fan, no other bank protection is proposed in this sub-area. For most of the northern portion of the fan, no significant bank erosion impacts are projected. However, the bank between the river and the fan becomes progressively steeper to the south, particularly in the Jordan Creek area, and some loss of arable land may occur due to bank erosion caused by the increased water levels of the proposed project. Within the ALR, approximately 3000 m of high to moderate capability lands front onto these higher, steeper banks.

SUB-AREA 8: BLUEBERRY CREEK - GENELLE

The only ALR areas potentially inundated by the project in this sub-area are minor amounts of non-arable (Class 7) lands. No

bank protection is proposed along the only ALR area potentially impacted by the project. As this area occurs on a high terrace fronting on a steep bank to the river below, some erosion of arable lands may take place if the project proceeds. About 200 m of high to moderate capability ALR land may be affected.

SUB-AREA 9: BILLY CREEK

The only ALR lands potentially inundated by the project in this sub-area are non-arable (forested Class 7). However, a proposed borrow area, as well as damsite works and construction areas will occupy almost all of the arable portions of the one block of ALR land located in this sub-area. The proposed borrow area would result in aggregate removal from an area of about 16 ha, a construction area would occupy an additional 2 ha and about 1 ha would be excavated for the dam cutoff wall. All of these potentially impacted areas are arable.

These areas are presently served by a rough access road from Sunningdale (Trail) and are in an area identified by local government agencies as having potential for future urban development. Almost all of this land is privately owned, with only the northernmost portion of the terrace remaining as Crown land. In these circumstances it is reasonable to project some future agricultural use of this area in the absence of the project, although it is unlikely to be an intensive use. While tree fruits remain a possibility, small scale forage production or improved pasture, in conjunction with hobby farm or rural residential use, is more likely.

These areas need not be permanently lost from the agricultural resource base if the project proceeds. With suitable attention to reclamation planning, it should be possible to restore an

equivalent area of like or even improved capability after the project is completed. For the purposes of impact assessment, it has been assumed that B.C. Hydro will reclaim this area and return it to private hands once the project is completed. As any use in the absence of the project is not projected to occur for several more years, no agricultural impacts are attributed to transitory use by B.C. Hydro.

Portions of two fluvial terraces outside the ALR in this sub-area will be inundated at the proposed reservoir level of EL 424 m. In the absence of the project, no agricultural development of these currently unused areas is foreseen. The major factors limiting development are the relatively small arable areas involved, the lack of nearby arable lands, the lack of access and prohibitive costs of providing access, and the isolated position of these two units.

SUB-AREA 10: OASIS

ALR lands potentially inundated by the proposed project in this sub-area total 30 ha, almost all of which consists of high capability Class 2 lands located on a largely undeveloped, forested recent river terrace north of the golf course in Birchbank area. A cleared portion of this terrace has been developed as a picnic site, and the CPR rail line and right-of-way runs through the middle of the terrace. At the higher reservoir levels initially considered, 31 ha of land would be inundated.

Because the railway would be inundated at the proposed pondage level of EL 424 m, it is proposed to construct an elevated causeway through this terrace. This causeway would occupy 3 ha of high capability undeveloped ALR land, and about 3 ha of

presently built up areas (picnic site plus portions of the existing right-of-way).

In total, 23 ha of undeveloped arable land in this sub-area would be inundated or occupied as a result of the proposed project. In the absence of the project this area represents a reasonable prospect for agricultural development. Historically, similar lands now occupied by the golf course were farmed mostly for forage production. With irrigation, this area would be suited to a wide range of agricultural production: vegetables, small fruits, tree fruits or forages. Murphy Creek is fully recorded but an irrigation licence may be available on Sullivan Creek. Alternatively, water could be drawn from the Columbia River to irrigate this area.

The present tenure of this property has not been established, although it is privately owned. In the absence of any restrictive tenure, this area represents a good agricultural development prospect in the event that the project does not proceed.

In addition to the above potential impacts, some bank erosion caused by the proposed reservoir may impact on arable lands located west of the proposed causeway. High to moderate capability lands front about 1200 m of steep banks immediately above the terrace that will be inundated at the proposed reservoir level of EL 424 m. A portion of this area is currently being used under lease by a local hobby farmer.

No ALR areas are affected by possible damsite works in this sub-area.

AGRICULTURAL IMPACT EVALUATION

SUMMARY OF STUDY AREA IMPACTS

Impacts From Inundation

Three major areas of possible agricultural impacts are evident in the study area: the Kootenay confluence/Brilliant area, the Champion Creek terrace area, and the Birchbank terrace area. One other minor area of possible impact is the area to the south of Cai Creek in sub-area 6. Additionally, in sub-area 7 a farm access road may be inundated.

The Pass Creek sub-area contains a significant amount of ALR land potentially affected, but little agricultural impact is envisioned due to the dominantly non-agricultural use projected in this area.

No agricultural impacts due to inundation are predicted for sub-areas 1, 2, 5, 8, or 9.

Tables 4.1 and 4.2 detail areas of ALR lands potentially inundated by the project at the proposed reservoir level as well as at the two alternate reservoir elevations initially considered. Both the agricultural capability and present land use of potentially affected areas are addressed. A total of 83 ha of ALR lands are potentially affected at the proposed reservoir elevation of EL 424 m, 155 ha would be affected at EL 427 m and 209 ha are subject to potential inundation at EL 430 m. About three-quarters of these amounts represent arable lands, the greatest portion of which is high to moderate capability Class 2 and 3 areas.

Very little of the arable land potentially affected is presently used for commercially-oriented agriculture. At EL 424 m only 14 ha of potentially affected lands supported commercial

Table 4.1

ALR AREA POTENTIALLY INUNDATED, IN HECTARES, BY PRESENT LAND USE

LAND USE	SUB-AREA 1	SUB-AREA 2	SUB-AREA 3			SUB-AREA 4			SUB-AREA 5	SUB-AREA 6			SUB-AREA 7			SUB-AREA 8			SUB-AREA 9			SUB-AREA 10			TOTALS		
			424 m	427 m	430 m	424 m	427 m	430 m		424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m
FORAGE			-	-	-	14	18	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	18	18
DECADENT ORCHARD			-	-	-	1	14	19		-	-	1	1	7	10	-	-	-	-	-	-	-	-	-	2	25	34
CLEARED LAND/ GRASSLAND	NO ALR LANDS	NO ALR LANDS	-	1	1	1	12	18	NO ALR LANDS	1	3	10	1	3	4	-	-	-	-	-	-	-	-	-	3	15	29
HOBBY FARM/ RURAL RESIDENTIAL			4	7	7	-	-	2		-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	7	10
BUILT UP			-	-	-	-	4	4		-	-	-	-	-	-	-	-	-	-	-	-	7	7	7	7	11	11
OTHER			9	14	14	4	15	14		7	12	33	7	10	16	<1	<1	1	3	4	5	23	24	24	53	79	107
TOTALS			13	22	22	20	63	75		8	15	45	9	20	30	<1	<1	1	3	4	5	30	31	31	83	155	209

Table 4.2

ALR AREA POTENTIALLY INUNDATED, IN HECTARES, BY AGRICULTURAL CAPABILITY

AGRICULTURAL CAPABILITY CLASS (BCLI)	SUB-AREA 1	SUB-AREA 2	SUB-AREA 3			SUB-AREA 4			SUB-AREA 5	SUB-AREA 6			SUB-AREA 7			SUB-AREA 8			SUB-AREA 9			SUB-AREA 10			TOTALS		
			424 m	427 m	430 m	424 m	427 m	430 m		424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m	424 m	427 m	430 m
2	NO ALR LANDS	NO ALR LANDS	8	14	14	11	30	35	NO ALR LANDS	-	-	1	-	2	5	-	-	-	-	-	-	20	20	20	39	66	75
3			-	-	-	-	-	-		-	-	14	5	11	14	-	-	-	-	-	-	1	1	1	6	12	29
4			3	6	6	5	22	25		1	3	12	-	-	-	-	-	-	-	-	-	-	-	-	9	31	43
5			-	-	-	1	4	5		1	1	1	-	-	-	-	-	-	-	-	-	1	1	1	3	6	7
6			-	-	-	1	2	3		3	4	6	<1	1	2	-	-	-	-	-	-	-	-	-	4	7	11
7			2	2	2	2	5	7		3	7	11	4	6	9	<1	<1	1	3	4	5	8	9	9	22	33	44
TOTALS			13	22	22	20	63	75		8	15	45	9	20	30	<1	<1	1	3	4	5	30	31	31	83	155	209

hay production, and much of this was very low intensity farming (cropping of native grasses). However as much as half the area potentially affected may have been cultivated at some time in the recent past. These areas have since been abandoned or have moved into alternate uses, such as hobby farms, rural residential areas, and built-up areas. About half of the area potentially affected has never been developed for agriculture. Some of this area is non-arable and most of it is forested. For the most part, the non-arable portions are not suited to livestock grazing for reasons more related to land tenure patterns than to a lack of biophysical capability.

Although some arable lands outside the ALR could also be potentially affected by the project, generally these areas have been or will be developed for non-agricultural uses and do not represent a significant source of additional potential agricultural impacts due to inundation. A few other minor, isolated areas which could be potentially inundated are undeveloped at present and are likely to remain so in the absence of the project.

Impacts From Construction

Two areas of possible construction-related agricultural impacts have been identified. In sub-area 9, proposed works would occupy a total of approximately 19 ha of undeveloped arable land within the ALR. With reclamation, this area could be eventually returned to the resource base.

In sub-area 10, approximately 3 ha of undeveloped arable land within the ALR would be occupied by the proposed relocation of the railway in the Birchbank area. This potential impact would be permanent.

No other significant agricultural impacts related to project construction activities were identified in the other sub-areas.

Impacts From Bank Erosion

Approximately 7 km of arable ALR lands have been identified which are located on the edges of terraces with banks which may be eroded as a result of increased water levels created by the project. These lands are located along areas where no shoreline protection works are proposed. They are principally located in sub-areas 6 and 7, although minor areas have been identified in sub-areas 4, 8, and 10. In addition, it is possible that a small hobby farm located outside the ALR in sub-area 2 may be affected.

In areas where B.C. Hydro has proposed bank protection, the assumed worst case safeline without protection is typically located 10 to 20 m in from the existing terrace edge. This projected safeline is the result of assumed long-term (70 year) beach slopes of 1:5 and bank slopes (oversteep banks only) of 1:1.5. These allowances indicate that as much as 7 to 14 ha of arable ALR lands may be impacted by the project, assuming a worst case bank erosion scenario over the assumed 70 year life of the project. For the most part these lands are not being used for commercial agriculture at present, nor are they located in areas where such use is projected in the future. Only in parts of the potentially affected lands located on the Champion Creek fan and the Birchbank terrace area does it seem possible that potential future agricultural activity could be affected. However, because of the highly speculative nature of these potential impacts, and the minor amounts of land that may be involved, no further attempt has been made to define agricultural impacts.

AGRICULTURAL IMPACT EVALUATION

Operational Impacts

In addition to possible impacts due to inundation, project construction and bank erosion, project impacts are possible on the operation of agricultural enterprises which might occupy non-impacted lands in the future. These possible impacts include:

* increased irrigation capital costs related to intake modifications required for pumping from the Columbia during periods of fluctuating water levels caused by the project during the growing season

* decreased pumping costs due to lower average pumping heights

* adverse or beneficial sub-irrigation effects attributable to changing water table levels caused by the project

These possible impacts are highly speculative, difficult or impossible to establish, and at most if they did occur, are expected to be relatively minor in effect.

AGRICULTURAL VALUE OF AFFECTED AREAS

Value of Present Production of Potentially Affected Areas

The agricultural value of the potentially affected areas lies more in terms of future potential than present production. It is unlikely that the gross value of hay taken off the 14 ha of forage areas potentially affected at the proposed 424 m eleva-

tion exceeds $7,000 per year (1980 terms), based on an estimated yield of 5 t/ha and a price of $100/tonne. Net returns would be much lower after allowing for even modest costs of production.

Based on 1977 representative costs of hay production in the Lister (Creston) area (B.C. Ministry of Agriculture, 1977), inflated at 8% per annum to approximate 1980 terms, single cut harvesting costs are estimated at $235/ha or almost half of the above estimate of gross returns. This results in estimated net value of existing agricultural production that would be potentially lost due to inundation at EL 424 m of about $3,700 annually. This estimate would increase to $4,800 at reservoir elevations of 427 to 430 m.

This estimate does not include any valuation of agricultural products which may be produced in conjunction with hobby farm/rural residence holdings. Such holdings essentially constitute residential land uses and property should be valued in that context.

The only other present agricultural activity that would be foregone if the project proceeded is a small amount of cattle grazing that occurs on the Champion Creek terrace and possibly on other potentially affected lands. At an estimated 5 animal unit months (AUM) of grazing per hectare and a value of $30/AUM (assuming hay substitution), this grazing would have a maximum value of $900 annually if 6 ha of land were involved on the Champion Creek fan. This estimate would increase to about $2,100 at a reservoir level of 427 m and to $3,000 at 430 m. The present operator of the Champion Cheek private grazing lease indicated that he was paying $6/AUM for use of the area.

Data on actual farm gross and net incomes were not collected in the study area inventory because farm operators generally regard such information as confidential, and also because such information would have very limited usefulness. The project would not totally preclude any existing farming operation, so much as affecting some, usually minor, element of the operation which cannot be identified in any overall farm income figures.

Crown grazing lease and hay cutting permit values were also not collected as relevant economic estimates of present activity, since these are set by administrative fiat and have nominal values which are not indicative of economic worth.

Future Agricultural Development of Potentially Affected Areas

In terms of possible future agriculture production foregone, it is very likely that the proposed Murphy Creek Hydroelectric Project would have a much greater impact than that estimated above for present production. Although a total of 57 ha of arable ALR land is potentially lost at the proposed reservoir level of 424 m, the above sub-area impact assessments indicate that much of this area could not reasonably be expected to go into agricultural use even if the project did not proceed.

The only areas where it is reasonable to construct a scenario for future agricultural development are the Champion Creek terrace area, the Crown portions of the Kootenay River confluence area, and possibly the Birchbank river terrace area. Agricultural development of these areas, in the absence of the project, is not certain but it represents a reasonable possibility. Arable land in these three areas that may be affected at the proposed reservoir elevation of 424 m totals about

44 ha, mostly comprised of Class 2 and 3 lands. With irrigation water, which appears to be available in all cases, these areas are capable of producing a wide range of crops, including many vegetables, most tree fruits except for soft fruits (except in areas subject to a high water table), small fruits such as raspberries and strawberries, grains (although reasonable operating scales would not be possible), and forages.

Should these areas move into agricultural production in the absence of the project it is unlikely that all of these arable lands would be used. Practical considerations of irrigation system feasibility and field configuration would produce a degree of non-utilization common to irrigated agriculture. For the areas considered above, of the 44 ha of arable land potentially impacted, it is projected that about 26 ha of potential net field area would be involved, including 10, 1 and 15 ha of potential agricultural development in sub-areas 4, 7 and 10, respectively.

At a 427 m reservoir level, 52 ha of potential net field area would be affected, and at 430 m, 60 ha is estimated.

Possible Crop Production in Potentially Affected Areas

Allowing that soil, water, and climate differences exist between these sites and even within each site, and that crop response would vary accordingly, for the purpose of estimating potential agricultural values, these sites were assumed to be equally capable.

Since the range of alternate crops that could be considered at each site is too wide to exhaustively study, two candidate

crops were chosen to evaluate their production potential: field tomatoes and alfalfa hay.

Field tomatoes were chosen because this crop is especially well suited to the area, recent cost of production information was available for the crop, and they represent a high value crop that can be grown on a relatively small scale for a potentially attractive return. Because it is unlikely that other vegetable crops that could be grown in the area would produce, on average, significantly higher net returns, this crop represents a good economic proxy for the range of suitable vegetable crops.

The local market for fresh vegetables is very small and will only support limited amounts of local production, some of which is already in place in areas which will not be impacted by the project. Based on 1976 consumption and production information presented by the Select Standing Committee on Agriculture (SSCA, 1978), it is estimated that 1 ha of vegetable production can yield the in-season fresh consumption requirements of about 1,000 people for most common garden vegetables (including tomatoes, but excluding potatoes) that could be grown in the study area. Assuming a study area (and environs) population of 10,000, the area could theoretically absorb the produce from 10 ha of vegetable production. Because it is unrealistic to assume 100% market penetration by local production, and that local production will exclusively be derived from the potentially impacted areas, it is clear that vegetable enterprises cannot be projected for all the potentially impacted lands unless vegetable processing and/or significant exports from the area are possible. These latter developments are considered implausible, given processing economics and the availability of numerous alternate production sources for all nearby markets.

While the potentially impacted lands are suited to small fruit production (raspberries, strawberries), the local market for these products is insignificant. These areas are not suitable for tree fruit production due to the high water table conditions frequently encountered.

Because of the limited local market for seasonal fresh vegetables and other horticultural products, and because of a significant local market for hay and pasture, the returns from alfalfa hay production were chosen to represent the wide range of forage production or improved pasture options that could be carried out on the potentially impacted arable areas. Any of these areas could be used, as part of a larger operation, to supply part of this market. Portions of these lands are currently being used for this purpose.

Annual Net Returns to Potentially Affected Areas

According to a 1980 cost of production study of field tomato production in the South Okanagan area (B.C. Ministry of Agriculture, 1977), all costs of production excepting property taxes and return to land totalled $8,962/ha ($3,627/ac). On yields of 33.7 t/ha (15 tons/ac) and with most of the sales at the farm gate or direct into the fresh market, gross crop revenue equalled $10,584/ha ($4,283/ac), producing a net return to land of $1,622/ha ($656/ac). These yields, prices and sales patterns would be reasonable for the study area and the sites considered.

Alternatively, using a 1976 cost study of alfalfa hay production in the Kamloops region (two cuts under irrigation), and following the same approach as above, yielded a production cost estimate of $416/ha ($168/ac), assuming the crop is re-established every 6 years (B.C. Department of Agriculture,

1976). Inflating this 1976 cost estimate at 8% per annum produces a 1980 estimate of $566/ha ($229/ac). At an estimated yield of 9.0 t/ha (4 tons/ac) and an average price of $100/t (approximate average over last three years), alfalfa production is estimated to produce net returns to land of $334/ha ($135/ac).

Field tomato production and alfalfa hay production based on 1980 expectations, could yield $1,622/ha and $334/ha, respectively, as an annual return to land that is potentially affected by the project. Since it is unrealistic to think in terms of considerable areas being devoted to vegetable production in the study area and since most other alternate crops would produce lower net returns, an average of the net returns available from tomato production and alfalfa hay production has been employed in this study as indicative of average agricultural net returns possible on potentially affected areas. This amount works out to be $978/ha/yr ($396/ac/yr).

However, this value is representative of land that has been put into a state of productive readiness. Since much of the area considered would need some improvement (possible drainage improvements, some clearing, irrigation system installation, etc.) an average allowance of $1,850/ha ($750/ac) should be made for such improvement. That is, in order for future agricultural activity to produce the above annual net return, a capital investment of about $1,850/ha ($750/ac) would likely be required.

Agricultural Development Probability

Since it is unrealistic to think that all the potentially affected arable lands which stand some chance of being developed

for agriculture in the absence of the project would in fact do so, the above estimate has only been applied to 50% of the potential net field area under consideration. That is, for the proposed 424 m reservoir level, it is assumed that only 13 ha of the potentially affected arable areas considered would in fact be developed for intensive agricultural use in the absence of the project. For the 427 m and 430 m levels, the respective figures are 26 ha and 30 ha.

Value of Future Production of Potentially Affected Areas

These assumptions, as outlined above, indicate that up to about $13,000 of future agricultural net income would potentially be lost to inundation at the proposed reservoir level of 424 m. Since future development of these areas for intensive agriculture would preclude the small amount of current production taking place on these areas, care must be taken not to treat this value as being in addition to the loss of current production previously calculated.

For the purposes of a complete resource evaluation, it should be noted that this annual value of $13,000 as the estimate of total study area agricultural impacts at a reservoir elevation of 424 m, does not constitute valuation of the total economic rent produced by all 80 ha of ALR lands that would be potentially inundated at this level. It is only a value of the foregone agricultural income stream that would occur on the 13 ha of land that are projected to come into production in the absence of the project. The remaining 67 ha may generate values in alternate uses (eg. settlement) and should be valued according to such projected uses.

AGRICULTURAL IMPACT EVALUATION

The above agricultural impact evaluation is for the proposed 424 m reservoir level only. Employing the same methodology the potential future annual impact values for the other reservoir levels considered are as follows:

* 430 m reservoir level: $29,000 annually (30 ha)
* 427 m reservoir level: $25,000 annually (26 ha)

All values are 1980 dollars.

IMPACTS FROM A REGIONAL PERSPECTIVE

At present, study area agriculture makes a very minor contribution to total regional agricultural production. The loss of current production on potentially affected arable lands would have an insignificant impact on the region's agricultural economy.

This, however, is not entirely the case when future agricultural production is considered. The proposed project could affect about 9% of all the prime agricultural land (Classes 1-3) found in the study area, including some of the few developable, high capability lowland sites suited to intensive horticultural production that remain in the Columbia River Valley south of Nakusp.

In a wider regional context, this potential impact becomes much more diluted. The maximum total area of prime agricultural land affected by the proposed project represents less than one-half of one percent of all prime agricultural land found in the Arrow Lakes-Columbia River sub-region (refer back to Figure 2.1), and only about one-tenth of one percent of all prime agricultural land found in the West Kootenay region.

MITIGATION OPPORTUNITIES

The following mitigation opportunities should be given consideration in the eventuality of project implementation:

* a reclamation plan should be prepared and implemented for any agricultural lands used for aggregate extraction or temporarily occupied during project construction, as well as for any proposed reclamation of low-lying agricultural lands through berming and filling. Specifically, a plan should be prepared and implemented for the Billy Creek ALR area

* flood protection, by dyking or other means, should be considered for some potentially inundated arable lands where such protection can be economically justified

* provision of alternate farm access should be considered if existing access to the Champion Creek terrace is lost due to the project

* any project works not considered in this impact assessment due to lack of final definition, such as access roads, additional borrow areas and other such works should be designed so as to minimize adverse impacts on the agricultural resource base

* stabilization works should be considered if any areas of possible sloughing, increased erosion, or slope instability that could potentially affect the agricultural resource base are identified in future studies, and if such works can be economically justified

* a land acquisition policy that only secures tenure on those portions of agricultural properties or other arable lands directly required by the project, should be considered.

Specifically, one area which should be investigated for dyking feasibility is the southern portion of the Kootenay River fan. This area contains several rural residences, a possible industrial area and an area of high capability Crown-administered ALR land. These lands could be protected by dyking along approximately 800 m of the Kootenay River soutn shore. At a 424 m reservoir level, flood protection would protect 11 ha of high capability agricultural lands that have some development potential in the absence of the project. These lands would be capable of producing annual net monies of about $980/ha (1980 dollars), as estimated earlier. Detailed engineering studies are required to determine technical feasibility and, if feasible, to estimate dyking costs.

APPENDIX A

TERMS OF REFERENCE

SECTION E

AGRICULTURE

(a) Inventory

Describe and map at a scale of 1:25 000 (4 cm = 1 km) the agricultural land reserves and CLI soil and climate capability for agriculture below El. 500 above sea level in the study area. Show on the map the areas of each type and provide a detailed summary of agricultural areas above and below the reservoir level. Describe limitations to agriculture (climate, soils, etc.) and discuss range of crops which may be grown.

Examine all agricultural lands within the study area to determine their present uses, i.e. type of crops grown, yield, number of cattle raised, type of operation (dairy/beef), size of operation (hectares), gross and net income derived from products, markets, type of pasture or range (seeded, improved, irrigated, drained, native), amounts of fertilizer, irrigation needed.

Discuss importance of agriculture to the local communities and the region.

(b) Effect of Development

Prepare projections of the future agricultural potential and use for the study area with and without the project. Make assessments of the losses and benefits which might occur if development were to proceed to completion (e.g. loss of agricultural potential, hectares of agricultural land inundated, reduced irrigation costs, etc.).

APPENDIX B

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POOR

QUALITY

ORIGINAL